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MOUTH HYGIENE

BY

JOHN SAYRE MARSHALL, M.D.

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MOUTH HYGIENE
AND
MOUTH SEPSIS

Operative Dentistry

By JOHN S. MARSHALL, M.D., Sc.D.

Dental Surgeon of United States Army and President of Army Examining Board for Dental Surgeons.

Octavo. 635 pages. 725 illustrations.
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MOUTH HYGIENE

AND

MOUTH SEPSIS

BY

JOHN SAYRE MARSHALL, M.D., Sc.D.

SYRACUSE UNIVERSITY

CAPTAIN U. S. ARMY RETIRED

FELLOW AMERICAN COLLEGE SURGEONS; FORMERLY EXAMINING AND SUPERVISING DENTAL SURGEON U. S. ARMY; PRESIDENT OF THE BOARD OF EXAMINERS.

SECOND EDITION, REVISED

PHILADELPHIA & LONDON

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To

MY DEAR WIFE

Who For More Than Forty Years Has Been My
Chief Inspiration This Little Book Is
Affectionately Dedicated.

PREFACE TO SECOND EDITION

It is with great pleasure that the writer has prepared the Second Edition of this little text-book. This pleasure has been enhanced by the fact that it has seemed, as was the hope, to meet the demand for information, and stimulated the ever-growing interest of the dental and medical professions, as well as the general public, in the subjects of mouth hygiene and mouth sepsis.

The interest which has been awakened all over the civilized world to the supreme importance of maintaining a healthful condition of the teeth and the mouth, and the great danger to individual health and life which lurks in a septic mouth, has already done much towards mitigating these evils by stimulating the people to give greater attention to oral hygiene.

PREFACE TO SECOND EDITION

The book has been carefully revised and several new illustrations have been added.

It is the hope of the writer that those who read its pages may be inspired to arise to the relief of the poor, the indigent, and the unfortunate in their midst, who are in such vital need of appropriate dental treatment to safeguard their health and perhaps save their lives, by encouraging the establishment of free dental clinics in every community.

The writer and his publishers desire to acknowledge their obligations to the profession and the reading public for their generous patronage and trust that the revised and enlarged work will meet with the same generous support.

THE AUTHOR.

2912 Pine Ave., Berkeley,
January, 1916.

PREFACE

In the preparation of this little text-book the writer has endeavored to meet the needs of the Dental Profession, of students of dentistry and medicine, trained nurses, school-teachers, sanitarians, and the general public, for a work on the subject of mouth hygiene and mouth sepsis that would be comprehensive and not too technical.

All technical terms when used have been explained, so that the lay reader will be able to grasp the subject with the same degree of understanding as would the student of dentistry or medicine.

The subject is one of such vast importance to individual and public health, intellectual progress, and good citizenship, that it is hoped that the facts here gathered, and the suggestions made, will not only prove instructive and interesting as

matters of reference, but may be instrumental in creating greater interest and enthusiasm in the subject of mouth hygiene, and thus save many children from lives of misery caused by preventable oral diseases, which, if uncorrected, may lead to invalidism, immorality, drunkenness, crime, or insanity.

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PART I.

MOUTH HYGIENE.

MOUTH HYGIENE AND MOUTH SEPSIS

CHAPTER I.

INTRODUCTION.

HYGIENE.—Hygiene is that branch of sanitary science which treats of the laws of health and its preservation.

ORAL HYGIENE.—Mouth hygiene treats of the health of the mouth and its preservation.

SANITARY SCIENCE.—The science which includes a consideration of all that can be done for the prevention of disease and the promotion of public health.

Sanitation, therefore, is prophylaxis, and prophylaxis is the prevention of disease.

HEALTH.—That condition of the body in which all its organs are performing their functions in a normal manner. A hale or whole condition of body.

A noted monarch once said, "*The health of the people is the supreme law.*" A sentence more wise than this was never

spoken by human lips, for the idea here expressed lies at the very foundation of all material, intellectual and spiritual progress of a nation; and without it no true national greatness can ever be attained.

This fact is becoming more and more generally recognized by all civilized nations, and much interest is being manifested by the public generally in the efforts that are being made to stamp out disease, improve the public health, and increase longevity.

With this end in view great efforts are being made by the national government, by the various State governments and municipal boards of health along the lines of scientific sanitation to protect the public and the individual from the detrimental effects of impure water, unwholesome foods and beverages; the poisonous emanations of decomposing garbage and sewerage; the harmful effects of bad and insufficient ventilation, and the overcrowding of tenement houses; the isolation of all persons afflicted with infectious and contagious diseases, and the fumigation of clothing worn and

buildings occupied by such persons; the fumigation of all vessels upon which such diseases are found and the cargoes therein contained.

Physicians generally are teaching their patients the value of observing the various common rules of hygiene and sanitation and personal cleanliness; and yet the majority, the great majority have not yet learned to appreciate the fact that an *unclean mouth* is a most prolific, if not *the most* prolific, source of danger to the health of the individual of which we have any knowledge.

Dr. Osler, in a recent address before the students of the Royal Dental Hospital of London, said, "You have just one gospel to preach, and you have got to preach it early, and you have got to preach it late, in season and out of season. It is the gospel of the cleanliness of the mouth; cleanliness of the teeth; cleanliness of the throat. These *three* things must be your text through life."

"Oral hygiene—the hygiene of the mouth—there is not one single thing more important to the public in the whole range of hygiene; and it is with that which you, as practitioners, will have to deal."

The dentist is often thought to exaggerate the importance of a clean, healthful mouth and good, serviceable teeth; and to draw upon his imagination when he speaks of the dangers to the general health which lie hidden in decayed teeth, dento-alveolar abscesses, pyorrhœa alveolaris, and other dental diseases.

Upon this point Prof. Osler has also placed himself on record. He says, "If I were called upon to state which of the two, in my opinion, causes the most evil, alcohol or decayed teeth, I should unhesitatingly say decayed teeth."

Dr. Wiley, pure food expert, recently said, "One thousand children die daily in this country, their deaths due more to defective teeth than to other trouble."

Dr. Kirk, of the *Dental Cosmos,* says: "In Great Britain a systematic study of the mouth conditions of the public-school children revealed the alarming fact that only three or four per cent. had sound dentures, and that dental caries was an evil that was undermining the health of the nation. Similar studies in other countries furnished statistics which in general correspond with the figures obtained in England, showing that dental

caries is a disease universal in its distribution and constituting a factor of ill health second in importance to no other which affects the human race."

Dr. D. D. Smith, in a paper, read before the New York Institute of Stomatology, upon Oral Prophylaxis,[1] says: "It may seem presumptuous to intimate that in this subject of oral prophylaxis, when fully comprehended, are matters of a magnitude to radically modify the present thought and conception of dentistry, and to greatly change the present methods of practice. To advance a step farther, and suggest that there are hidden away under the *débris* of the oral cavity secrets of greater importance to the comfort and welfare of civilization than the great discovery of vaccination by Jenner in 1796, will doubtless seem as a magnification verging upon absurdity. And yet we venture to predict that the future of dentistry will disclose this as a truism."

Dr. L. Ashley Faught,[2] in speaking

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[1] International Dental Journal, vol. xxii, p. 817, 1901.
[2] Dental Cosmos, vol. xliv, p. 1021, 1902.

of Oral Hygiene, says: "It has come to be more appreciated that one of the great causes of decay in the teeth is lack of cleanliness, and that decay begins at the outer surface of the tooth, most frequently at the points most difficult to keep clean. . . . Clearly the work of the patient is *oral hygiene,*—the maintaining of the oral cavity in a state of health. The work of the dentist is dental prophylaxis,—the placing of the teeth in condition to prevent disease, a state favorable to oral hygiene. Thus it appears, from any strict definition of the two words, that the end to be obtained by either dentist or patient is one and the same, —prevention of disease, maintenance of health."

In an article on Oral Hygiene read by Dr. L. P. Bethel, [3] he quotes Dr. Knowlton, dental examiner at the Barberton, Ohio, Diamond-match Factory, as saying: "He is confident that the influence of oral hygiene is farther reaching than ordinarily imagined. Since its enforcement among these employees it has been

[3] Fourth International Dental Congress, St. Louis, 1904.

a noticeable fact that fewer days are lost through sickness. He believes it has an influence on the digestive tract and that better general health is maintained. Also it has been noticed that during epidemics of disease fewer employees are affected by prevailing maladies than before these prophylactic measures were adopted."

THE UNCLEAN MOUTH.

We know of nothing that is more shocking and disgusting than a mouth which is a stranger to the tooth-brush, or one that only semi-occasionally is treated to a half-hearted scrubbing with this most invaluable toilet article. Do we not turn away from such individuals with positive loathing? Do we not shun them almost as much as we would an individual suffering from small-pox? And why? Because they are poisoning the air which you and I must breathe with myriads of disease-producing micro-organisms, perhaps the organisms of pulmonary tuberculosis, pneumonia, diphtheria, tonsillitis, bronchitis, la grippe, and numerous others.

The science of bacteriology applied to the study of the organisms found in the human mouth has demonstrated more than a hundred different forms, many of them disease-producing organisms. In fact nearly every form of pathogenic micro-organisms known to bacteriologic science has been found at some time to inhabit the human mouth. This being the fact, what an ever-present danger to the individual and the public is an unclean, unsanitary, unhygienic mouth!

In this connection it may be well to consider for a few moments the rapidity with which some of the disease-producing micro-organisms reproduce themselves.

MULTIPLICATION OF BACTERIA.[4]

The process of reproduction in bacteria is a very rapid one. Flügge observed the process of segmentation in a coccus—a globular organism—to be completed in twenty minutes. Cohn has made the calculation that if it should take one hour to complete this process of segmenta-

[4] Marshall's Operative Dentistry, third edition, pp. 91, 92.

tion—division—and of the new cell to attain the size of the parent cell, one coccus, multiplying by this process, would in a single day produce 16,000,000 progeny; at the end of two days 281,000,000,000; while at the end of the third day it would have reached the enormous number 46,000,000,000,000. Such figures are at first thought very startling, and if the multiplication could go on unhindered the earth might soon be dominated by these micro-organisms. There are, however, many curcumstances which constantly oppose them; one of the chief of these is their own delicate susceptibility to change of environment, the slightest difference in soil, amount of oxygen, temperature, or moisture being sufficient in many instances to arrest their growth or completely destroy them. Various specimens are found growing together, but the struggle for existence, and natural selection, is as active here as elsewhere; the stronger and more vigorous soon destroy the weaker. When they enter healthy bodies they are attacked by the phagocytes—the white cells of the blood—and destroyed, or they do not find a congenial

soil in which to grow, and either die or are swept out of the body by the excretory organs.

Miller [5] has made the estimate that in a certain very unclean mouth there were not less than 1,140,000,000 micro-organisms. Think of the vitiating effect of such a mouth upon the general health of the individual and upon the atmosphere of a room inhabited by such a person; of the myriads of these organisms that enter the lungs at every inspiration and of the myriads that are thrown into the atmosphere by every expiration and by every act of coughing or sneezing; of the multitudes that are swallowed with every mouthful of food or drink; of their effect upon the delicate lining membrane of the bronchi and air-vescicles of the lungs, and upon the mucous membrane of the stomach and intestines. The wonder is that diseases of the throat, of the air-passages, of the lungs, and of the stomach and intestinal tract are not more common than they are.

The *unclean mouth* is always a *dis-*

[5] Micro-organisms of the Human Mouth.

eased mouth. It has been said, "The man with the healthy mouth is never sick: the sick man never has a healthy mouth." The first part of this proposition may be open to question, but the latter never. A man with a healthy mouth may eat food or drink water or milk infected with the cholera bacillus or the typhoid bacillus, and die from their effects, in the former case in a few hours, in the latter in a few days or two or three weeks.

As a general proposition, however, the statement is correct, for the man with the healthy mouth is usually in vigorous health and will be able to resist these infections if the organisms are not introduced in overwhelming numbers. If his opsonic index is high, which is another way of saying, if his resistance power is high, he may escape altogether. The man, however, who has an unclean and diseased mouth has never a high resistance power against disease. "Cleanliness is next to godliness," and godliness is to be Godlike. Can any one conceive of our God being unclean? Therefore, if we are Godlike we must be clean physically, morally, and spiritually. If we are Godlike we will

be every whit clean physically as well as in other respects, and if we are every whit clean we will have clean mouths and keep them so.

The tooth-brush is the yard-stick by which the degree of civilization of a people or a nation may be measured. From time immemorial the care which a people or a nation has given to its teeth, is the index of the degree of its civilization.

Booker Washington, of Tuskegee, has said, "The tooth-brush is the greatest of all civilizing agents." He found that when he had succeeded in teaching his students to keep their teeth clean, he had stimulated in them a sense of self-respect, and this is necessary to civilization in its higher forms.

This is to be the age of the tooth-brush, and the gospel of the tooth-brush is to be preached from one end of the world to the other, and nothing shall stop it, for it is a righteous gospel and one that has for its aim the betterment of the health and consequently of the happiness of the human race.

Hygiene of the mouth must deal, not only with the question of cleanliness, but

also with diseased conditions and their prevention. An unclean mouth leads to decay of the teeth, and decay of the teeth leads to exposure of pulps—miscalled nerves—which causes most excruciating pain. This condition if neglected leads to dento-alveolar abscess—miscalled ulcerated teeth—which not only causes severe pain and great swelling when the abscess is an acute one, but it may lead to acute septicæmia—blood-poisoning—and not infrequently to death. Or if the abscess pass into the chronic stage it may give rise to pyæmia—a chronic state of blood-poisoning—which may continue for months and finally end in death unless the cause is discovered and removed. Another diseased condition frequently found in the unclean mouth is gingivitis—inflammation of the gums—usually caused by the accumulation of salivary calculus—tartar—and the accumulations of food débris—particles of food left upon and between the teeth, which are soon in a state of acid fermentation from the action of certain bacteria always found in the human mouth, and which in a few hours forms acids which dissolve the lime salts

in the enamel and dentine and thus establish dental decay; while the accumulation of the tartar and the food débris act as mechanical and chemical irritants to the gum tissue and thus establish inflammation of the gums.

This condition of inflammation of the gums frequently leads to atrophy—a wasting away of tissue—and to a loss of the alveolus—bony socket of the tooth—by a process of caries—an inflammatory condition which dissolves the bone by slow degrees— and ends in the final loss of the tooth.

Another disease that is frequently found in an unclean mouth is pyorrhœa alveolaris, or Riggs's disease—a chronic inflammation located in the pericementum—membrane covering the roots of the teeth—and in the alveolar process or sockets of the teeth, which produces a gradual and painful dissolution of these structures accompanied by a flow of pus from the alveolus or socket, resulting in an ultimate loss of the teeth, and due to constitutional causes, such as rheumatism, gout, diabetes, and Bright's disease, and aggravated by local irritation from

salivary deposits—tartar—and the accumulation upon and around the teeth of food débris which is in a septic or putrefying condition.

Stomatitis—inflammation of the lining mucous membrane of the mouth—in its various forms is frequently present in an unclean mouth. This disease is most often found in the mouths of infants and little children, particularly in foundling hospitals and orphan asylums. It is an infectious disease and readily transmitted by nursing-bottles, spoons, and drinking-cups. The disease is mycotic—fungus micro-organisms—in its origin; the organisms flourishing in unclean rubber nipples, nursing-bottles, rubber soothers or comforts, milk-bottles, and unsanitary refrigerators, etc.

Pharyngitis—inflammation of the back part of the throat—is another common disease often found associated with an unclean mouth, and is due usually to infection from the mouth.

Tonsillitis—inflammation of the glands lying upon either side of the inner surface of the throat—is usually found associated with an unclean mouth. It is an infec-

tious disease, and is also due to micro-organisms. This disease spreads very rapidly among school-children housed in close and ill-ventilated school-rooms and who are permitted to use common drinking-cups, common towels, common slates, pencils, and pens. The public drinking-cup, public towels, common slates, pencils, and pens should be banished forever from our public schools as an imperative sanitary measure against the spread of such infectious and contagious diseases.

One of the precepts taught Japanese children in their schools, and has been for generations, is the following: "Disease, it is said, enters through the mouth. Be watchful as to what you eat and drink." This ought to be written in letters of gold and hung on the walls of all school-rooms.

During the hot season of the year city people who can afford to do so flee to the country with their children, to find cool, pure air and fresh food, and this is wise and beneficial, provided the sanitary conditions of the new environment are what they should be. Many of these summer resorts are far from being what they

should be, from a sanitary stand-point. The ignorance or the cupidity of the management of many of these places is such that they make no adequate provision for the protection of the water supply from contamination with the sewerage of the premises, and, instead of burning all kitchen refuse, cart it into some back lot and allow it to rot and putrefy in the sun and breed flies by the million. Such places are more dangerous to the health and lives of the children than the heat and possible unsanitary conditions from which they have fled.

Flies are a prolific source of infection. They are the most filthy of all insects, and every effort should be made to prevent their propagation and multiplication by destroying all matter upon which they feed. Refuse from the kitchen, garbage, excreta of the body, stable droppings, and refuse should be removed each day and destroyed by burning. All food and nursery apparatus should be protected from flies by proper cover-screens. Most of the sporadic cases of typhoid fever found in our cities can usually be traced to an infection received at some supposed health resort or summer camp.

MOUTH HYGIENE

Most people are extremely careful to have the foods and drink which enter their mouths free from everything that could be considered in any way unsanitary; and yet many of these same people have very unclean mouths, not seeming to recognize the fact that they carry within their mouths unsanitary conditions that are infinitely more dangerous to health and life than the dirt and possibly infectious materials that have been removed in the careful preparation of their food, and which, when thoroughly masticated in an unclean, unsanitary mouth, has been rendered positively unfit to enter the stomach. Is this failure to recognize the importance of a clean mouth due to ignorance, indifference, or inconsistency? We think we may safely say, in deference to the usual habits of the people generally, that it is due to *ignorance* of the facts. With this thought in mind it will be our endeavor to lay these facts, as best we may, before our readers in the following pages.

CHAPTER II.

THE PREVALENCE OF ORAL DISEASES.

ORAL DISEASES.

Diseases of the mouth are so prevalent that it may be said practically no one escapes. The writer during a practice, both civil and military, of more than forty years, in which he has examined many thousands of mouths, has never met with but *four* instances of persons who had reached adult life who were free from *any* form of dental or oral disease. One was a young lady twenty-four years of age, another a gentleman of fifty, the third an officer in the United States Army, twenty-four years old, a recent graduate of West Point, and the fourth a lady, a college graduate, twenty-five years of age.

Dental caries—dental decay—is without doubt the most common disease that affects the human family at the present time, and from which very few persons

among civilized nations wholly escape. It seems to be pre-eminently a disease of higher civilization, as it is most common among those nations which are recognized as having the highest civilization; and yet no race or tribe of men yet discovered, whether savage, barbarous, semi-civilized, or civilized, ancient or modern, has ever wholly escaped it. Archæology, history, and anthropology all prove the correctness of this statement. Evidences are not lacking that the prehistoric man suffered from dental decay, alveolar abscesses, — miscalled ulcerated teeth—and other dental diseases. Many of the Egyptian mummies found in our great museums, and skulls of prehistoric periods, show well-marked evidences of caries and other dental diseases. One Egyptian mummy in the British Museum, dating back to a period about 2800 B. C., or more than four thousand seven hundred years ago, shows undisputed evidences of dental caries and other dental lesions.

The collections of crania of the prehistoric inhabitants of North and South America in the National Museum in Washington show occasional evidences of

dental caries and numerous evidences of alveolar abscess, from death of the tooth-pulp caused by the wearing down of the teeth. Evidences of pyorrhœa alveolaris are very rare. Dental anomalies, particularly irregularities in position, inverted teeth, and supernumerary teeth, are quite common.

It would be interesting to pursue this subject at greater length did space in this little volume permit.

PREVALENCE OF DENTAL DISEASES AMONG SCHOOL CHILDREN.

Very little interest has been manifested by the profession in the gathering of reliable statistics upon this subject until quite recently. The first comprehensive and reliable work of this kind was performed by the School Committee of the British Dental Association (Tomes). They reported having examined the mouths of 3368 boys and girls at the Hanwell and Sutton schools and at the Exmouth training-ship. Out of this number only twenty-three per cent. had sound dentures, or, in other words, seventy-seven per cent. were affected with dental

decay. These boys and girls ranged from three and a half to seventeen years of age, but the majority were from five to fourteen. Two hundred and five children belonging to high-class schools did not compare favorably with those less fortunately placed. Further comparison was not made, as the number was too small to give conclusive results.

Major P. J. Probyn, of the medical service of the British Army, says: [1]

"On comparing the various recruiting returns in the Army Medical Department reports, we find that an immense amount of good material is lost to the service from defective teeth, either due to carionecrosis—dental decay—or the actual loss of the members; and this, be it noted, occurs in otherwise strong and healthy youths, who, if fitted with artificial dentures, may still become useful fighting men. At one time the Government would not allow the enlistment of men with defective teeth, and not without a certain good reason, for what use is a man in the field with defective teeth? He will

[1] British Journal of Dental Science, vol. li, p. 873, 1908.

soon lose his good state of health if he is not able to thoroughly masticate the hard biscuit and ' bully ' beef. Now I am glad to say a much more liberal view is taken of the situation, and recruiting officers are not hampered, but must use their own discretion and may admit men with artificial dentures.

" In the last report of the Army Medical Department (1907) we find that 19 per cent. of the candidates were lost to the army on account of defective teeth."

Ottofy computed, from an examination of 14,644 teeth of American public-school children, that dental caries was present in 27.33 per cent. in the boys and 32.67 per cent. in the girls.

This statement gives a better showing for the American public-school children than for the children in the Hanwell and Sutton charity schools. This difference is explained by the fact that the latter children were from the poorest class of English society, while the American public school represents all classes of society, including many who receive regular attention from the family dentist.

The Schleswig-Holstein Dental Soci-

ety,[2] in a recent examination of the mouths of the school-children in Northern Germany, conducted by Dr. Greve of Lubeck, reports that of 19,725 children examined, 95 per cent. showed dental caries. This investigation included the children of nineteen towns. The boys were found to have somewhat better teeth than the girls, the difference being about 3 per cent. in favor of the boys.

From the dental inspection of the public schools of the city of Antwerp in 1900[3] the following facts were obtained: "The number of attendants of the schools in March were—boys 9543; girls 10,148; kindergarten 4778; total 24,469. The kindergartens are frequented by children of three to six years of age; in the other schools the ages vary between six and sixteen years. Amongst 12,000 children examined by Dr. Verhuysen, he found 1721 without caries, 2138 with one or two teeth affected, and 8141 with several teeth affected. During the first inspection 947 extractions were made, in the second 545,

[2] Cor. Blatt für Zahn., July, 1899.

[3] Transactions American Public Health Assn., vol. xxvii, p. 287.

and in the third 405, making a total of 1897." Associated with the decay of the teeth were numerous other abnormal conditions, such as inflammation of the maxillary sinus, facial phlebitis, necrosis, noma, ranula, and epulis.

"The statistics lately compiled of children of six to fourteen years of age and youths from twenty to twenty-three years of age in Germany by the recommendation of Röse are no less lamentable. The best localities showed 78 per cent. of the people with diseased teeth, and in places where calcium was scarce (?) the percentage reached 99." [4] Statistics from Sweden and Russia show similar conditions. Cunningham found that in 10,517 pupils of the age of twelve in English and Scotch schools 85.8 per cent. had dental decay.

In more recent examinations made of the school-children in various cities scattered all over the United States from north to south, from east to west, it has been found that dental and oral diseases

[4] E. Jessen (of Strassburg), Trans. American Pub. Health Assn., 1901.

afflict from 75 to 96.5 per cent. of all the children examined.

It will be observed by the preceding brief summary of the prevalence of dental and oral diseases,[5] that the nations of the present day which suffer most from these affections are the Anglo-Saxons of America and Great Britain, and the great European nations. The growth of modern dental science and the perfection of the art among these nations has been a work of necessity, and one which from its surgical and prosthetic aspects has kept pace in its development with the demands made upon it.

But viewed from the more important aspect of prophylaxis, it has not yet attained nor kept pace with the ever-increasing needs in this direction.

When one stops to consider how widespread and universal dental and oral diseases have become, and the increasing number of teeth that are destroyed by disease every year, we are appalled by the problem, and wonder if the human race is not destined to become edentulous—toothless.

[5] Marshall's Operative Dentistry, third edition, p. 130.

The teeth of the present generation seem to be inferior to those of their immediate ancestors, while the children of to-day have, as a rule, a greater predisposition to dental diseases than their parents. In other words, there seems to be a gradual deterioration in the structural development—perfection of development—of the teeth, and a lowering of the resistive powers or the vital energy of the system against the encroachment of disease.

Perfection in the structural development of the teeth of city-bred children of the middle and better classes of society is the exception, defective teeth the rule. Little children between the ages of three and six years are frequent sufferers from dental caries, odontalgia, and alveolar abscess, while very many have defective first permanent molars which require operative treatment as soon as they are erupted.

This is the age of steam and electricity, of the lightning express train, the ocean greyhound, of the electric telegraph and the telephone, the high-speed automobile and the flying-machine. Men and women

too have seemingly partaken of the energy and speed of these forces. It is an age of rush and whirl. Men and women vie with each other and with their sex for place and power. In business and social life, in educational matters, in pleasures and vices, they go at high-pressure speed, and as a result often break down at a period of life when under more favorable circumstances they would still be in their prime.

These conditions are manifested everywhere in the civilized world, but most noticeably in the great cities, where the intensity of the struggle of the poor for existence, and of the well-to-do and rich for supremacy over their fellows in business, social pleasures, education, and display, are the greatest. Children born under such circumstances have generally constitutions which are far from robust, nor equal to those inherited by their parents, and as a consequence they are handicapped in their struggle for existence either by the direct inheritance of disease, or of tendencies and predispositions to disease which are the result many times of the terrible deprivations of

poverty, of overwork, or of over-indulgence in the luxuries and the pleasures of life, or possibly of the indiscretions or the vices of their parents or earlier progenitors,—for "*the sins of the fathers are visited upon the children, unto the third and fourth generations.*"

The report of the Surgeon-General of the U. S. Army for 1903 shows that the percentage of dental diseases among the troops serving in the United States was 42.85. For those serving in the Philippine Islands it was 61.12, or 18.27 per cent. higher than for troops serving in the United States, while for those who served in Cuba and Porto Rico it was 64.02, or 21.17 per cent. higher than for those who served in the United States.

During the years 1901, 1902, 1903 the dental surgeons of the United States Army treated 70,259 teeth by filling or extraction. Of this number 43,704 were in the upper jaw and 26,555 in the lower. The percentage of caries for the upper was 62.20, while in the lower teeth it was 37.80. The difference in liability to caries between the right and left sides is very slight, the left side being a little

more susceptible. The number of teeth treated upon the right side was 35,000 and on the left side 35,259, the percentage for the right side being 49.81 and for the left 50.19, a difference of only 0.38.

In 1904 the writer, for the purpose of obtaining exact data as to the condition of the teeth of the United States soldiers under the most favorable conditions, selected for this purpose two regiments that had recently returned from the Philippine Islands after the service of two years or more. These examinations were conducted in the most careful and systematic manner by the writer and two junior dental surgeons as assistants, with the following results. In the first regiment it was found that 89.17 per cent. of the enlisted men were in need of immediate dental treatment; while the examination of the second regiment revealed the fact that 97.25 per cent. of this command were in a like condition. Of the number in both regiments who did not require dental treatment, several had been fortunate enough to receive treatment by the army dental surgeons just

before sailing for the United States. The condition found in these two regiments, it is believed, is a fair sample of the conditions to be found in all United States troops who have served in the tropics for two or more years.

The military reports of the armies of Great Britain and Europe in which dental examinations have been made show a similar condition in relation to the prevalence of dental diseases. Some of these nations have already appointed dental surgeons to care for the teeth of their soldiers, while others have the matter under consideration. The German Army has taken the lead in the matter of oral hygiene. Orders were issued some time ago that every soldier should brush his teeth at least once each day, before morning inspection, and it was made the duty of the first sergeant of each company to see to it that this order was strictly obeyed.

In the Philippine Division of the United States Army the authorities have gone a step farther, by the issue of an order, upon the recommendation of the writer about six years ago, not only

requiring the enlisted men to brush their teeth every day, but making it the duty of the post surgeon at the monthly special inspection to see that the men were keeping their teeth clean, and to order such as had decayed teeth to report to the dental surgeon for treatment.

Through representations made to the Surgeon-General by the writer in 1904, the dental requirement for enlistment was raised from two serviceable opposing molars in each jaw—one above and one below—on each side, to four serviceable opposing molars in each jaw—two above and two below—on each side. The enforcement of this requirement, however, so reduced the number of eligible recruits that the War Department was obliged to return to the original requirement of two serviceable opposing molars in each jaw—one above and one below—classing the bicuspids as molars. The experience of the writer at the Columbus Barracks Recruit Depot leads him to the opinion that there are very few young men among the class who apply for enlistment that have reached the age of twenty years who have not lost the first permanent molars,

or in which these teeth are not badly decayed; while many others have lost from one to two bicuspids.

From twenty-five to thirty per cent. of all the recruits passed by the surgeons at this post were ordered to report to the dental surgeons as needing immediate treatment for dental caries,—pulpitis, dento-alveolar abscess, salivary calculus, gingivitis, or necrosed teeth and roots.

In personal conversations with volunteer officers who served in Cuba and the Philippine Islands during the Spanish-American War, it was learned that from ten to twelve per cent. of the enlisted force of their several commands were constantly incapacitated for duty by reason of dental diseases.

The introduction of dental service as a part of the medical care of the army has greatly reduced this percentage, and by that much has added to the health, comfort, and efficiency of the army.

Great Britain, during its Boer War, had a similar experience, and was obliged to send out a number of dental surgeons to combat these diseases.

CHAPTER III.

THE HUMAN MOUTH; ITS CARE FROM BIRTH TO THE COMPLETION OF FIRST DENTITION.

The Oral Cavity, or mouth, is the entrance to the alimentary canal. It is a grinding and mixing organism, — to change the form of expression, a mill in which the food intended for the nourishment of our bodies is ground, triturated, and mixed with the fluids from the salivary glands and prepared to be acted upon by the gastric juices.

This cavity is formed by the lips, cheeks, tongue, hard and soft palate, and the jaws. Emptying into this cavity by appropriate ducts are three series of salivary glands, known as the parotid, submaxillary, and sublingual. These glands secrete fluids which contain chemical substances, elaborated by the vital processes of the body, ptyalin, a special ferment, being the most important, as it converts starch to sugar and prepares it to be acted upon by the secretions of the stomach.

Situated in the surface of the mucous membrane of the lips, cheeks, palate, and tongue are numerous small glands for the secretion of a fluid more or less glairy in consistence, known as mucus. At the back of the mouth and at the entrance of the throat are situated two almond-shaped glands, one on either side, known as the tonsils. The principal known function of these glands is to secrete a thick glairy mucus, which envelops each bolus or mouthful of food when ready to be swallowed, and thereby assists its passage from the mouth to the stomach.

The mouth of the infant when first born is usually devoid of teeth. Cases are on record, however, in considerable numbers in which infants were born with from one to several teeth.[1] It has been stated that Richard Cœur de Lion of England and Louis XIV of France were born each with several teeth. Haller, in his "Elements of Physiology," mentions nineteen cases of children that were born with one or more teeth. The writer has several times been called upon to remove

[1] Marshall's Operative Dentistry, third edition, pp. 61–66.

teeth from the mouth of the new-born infant because the teeth interfered with nursing, and there are few physicians or dentists of twenty to twenty-five years' practice who have not had a like experience. Dr. Crump, several years ago, reported to the Virginia Society of Dentists a case of a child that was born with a full set of deciduous or milk teeth.

The normal activity of the salivary glands does not become established until the process of eruption of the teeth—cutting of the teeth—begins. Up to this time the diet of the infant has been composed only of milk, or ought so to be, and there has been no occasion for the presence of saliva containing the special ferment, ptyalin. Upon the appearance of the teeth the child craves, and should have, a more solid diet, which its alimentary system is gradually being prepared to receive and digest. No more reprehensible practice can be indulged in by young mothers and nurses than that of feeding infants with materials that are so manifestly unfit as starchy foods, fruits and meats before the function of the salivary glands is established and a sufficient number of teeth have erupted to make

mastication possible. More children die from improper feeding than from all other causes combined.

PRIMARY DENTITION.

The eruption or cutting of the deciduous or milk teeth is a physiologic process, and in a normal child is productive of so little general or local disturbance that many times the teeth make their appearance within the mouth before the parent or the nurse has realized the fact that the process of "teething" has really begun; while, upon the other hand, in children with impaired health and low vitality it often plays a prominent part in exciting various morbid conditions of the digestive, nervous, respiratory, and dermal (skin) systems. The subject becomes, therefore, one of considerable interest to the medical attendant and the dental specialist and of serious anxiety to the parents.

There is no doubt in the mind of the writer that the dangers from dentition have been greatly exaggerated by some authorities, and that parents are often unnecessarily anxious for their offspring during this period; yet it must be borne in mind that in certain temperaments and

under various physical conditions and environment there is a real danger present, and that morbid phenomena are sometimes excited which may progress to a fatal termination. When dentition is slow and the gums swollen and painful, lancing may be necessary, but this should be determined by the physician or dental attendant.

According to the mortality tables of London, as cited by West, dentition was assigned as the cause of death of 4.8 per cent. of all children dying under one year of age, and 7.3 per cent. of those who died between the ages of one and three years. This is not a high mortality, and yet it is more than likely that a goodly number of these deaths were due to improper feeding and unclean mouth conditions, rather than dental irritation.

The dangers surrounding the period of first dentition are much greater in large cities and in overcrowded localities, particularly among the middle and lower classes of society, than in the suburban and country districts. But the greatest mortality is in the foundling hospitals and in overcrowded and filthy tenements. A considerable number of these cases are

without doubt due to the unsanitary and unhygienic surroundings of these children and to unfit and spoiled food upon which they have been fed.

Contemporaneously with the eruption of the teeth, there is a very important developmental process taking place in the follicular or glandular apparatus of the whole alimentary canal, in preparation for the necessary change soon to take place in the character of the food that the system will demand.

This is a physiologic process, and under normal conditions, when all the functions of the body are nicely balanced, progresses without the least disturbance of general health; but under opposite conditions it may be productive of serious gastric and intestinal complications, the causes of which—viz., an unclean mouth, improper or spoiled food, etc.—are often overlooked, and the disturbances which are the result of these indiscretions during the period that these important physiologic changes are taking place, are attributed to morbid dentition.

The nervous system of the child at this period is also very impressible, the cerebro-spinal apparatus predominating to such

an extent that slight irritations of almost any character, in children of certain temperaments, may be followed by more or less general systemic disturbances, with elevation of temperature, vomiting, diarrhœa, bronchitis, and other catarrhal conditions, or reflex nervous phenomena, like strabismus,—squinting or cross-eye,—twitching of the facial muscles, rolling of the eyes, convulsions, or meningitis,—inflammation of the brain.

Normal Primary Dentition—cutting of the milk teeth—begins between the fifth and eighth months after birth, and terminates between the twenty-fourth and thirty-second months. The following table represents the average period of the eruption—cutting—of the various classes of teeth which constitute the temporary denture:

The central incisors, fron 5 to 8 months after birth.
The lateral incisors, from 7 to 10 months after birth.
The first molars, from 12 to 16 months after birth.
The cuspids (eye-teeth), from 14 to 20 months after birth.
The second molars, from 20 to 32 months after birth.

Fig. I

Head of Infant, Front View, showing Primary Dentition at about the Seventh Month.

Fig. II.

Right Side of Same

Fig. III.

Left Side of Same.

The lower teeth usually appear a few weeks in advance of the upper ones (Figs. I, II, III).[2] No general rule can be formulated from which, however, there will not be marked and frequent deviations.

The variations are so marked in the dates of the eruption of the teeth that no two authors give them exactly alike. Tubercular and syphilitic children cut their teeth very early, while in rhachitic—rickety—children the process begins very late.

THE CARE OF THE MOUTH OF LITTLE CHILDREN.

As soon as a child begins to take food its mouth should receive attention; but how few mothers or nurses ever think to cleanse a nursing baby's mouth! Much if not all of the suffering that some babies have to endure from nursing sore mouth—stomatitis—might be avoided by a little care upon the part of the mother or nurse in cleansing the mouth of the baby after feeding.

Oral hygiene, or oral health, must be based upon prophylaxis—the prevention

[2] Photographs from the collection in the Library and Museum of the Surgeon-General, U. S. Army.

of disease. The old, oft-repeated, and threadbare adage, " An ounce of prevention is worth a pound of cure," is most eminently applicable to the diseases of the mouth. A clean mouth is always a healthy mouth; while an unclean mouth is always an unhealthy or diseased mouth.

The mucous membrane of the mouth of the infant is very tender and sensitive and often the seat of various superficial lesions, consequently in cleaning the mouth of the infant care must be exercised not to injure or in any way abrade its surface. The gums of the nursing infant are often studded with so-called *epithelial pearls* which are in reality tiny *retention cysts.* These cysts may disappear by resorption or rupture spontaneously, and usually heal without marked symptoms. These minute lesions, however, may become infected from the presence of disease-producing micro-organisms growing in the mouth, resulting in ulcerated patches of more or less extent, which are sore and painful and frequently prevent the child from nursing, and in serious cases lead to grave forms of disease and to sepsis.

Moss and Epstein[3] are of the opinion that "the toothless mouth of the infant needs no especial care." From this opinion the writer most vigorously dissents. The uncared-for mouth of the nursing child is never free from particles of coagulated and fermenting milk, which are the soil upon which many forms of harmful micro-organisms grow and flourish. These organisms may and do often attack the minute lesions above referred to and thus establish a follicular stomatitis. It stands to reason, therefore, that, if the cause can be excluded by keeping the mouth clean, the disease will be prevented. Nearly all the forms of stomatitis that affect infants and small children may be traced to an unclean condition of the mouth. This being the fact, no argument is needed to establish the relationship between cause and effect.

Stomatitis of Nursing Children.—This is an affection that is rarely seen in children that are fed from the breast, unless the mother or wet nurse is unclean and careless about bathing the breasts

[3] Diseases of Children, vol. iii, p. 4, 1908.

and nipples. As a rule, it is a disease of bottle-fed children, and is usually due to an unclean, unsanitary condition of the feeding apparatus or to spoiled or infected milk. It is a mycotic—germ—disease, and is therefore easily prevented by thoroughly boiling all feeding apparatus—bottles, tubes, nipples, cups, spoons, pans, or whatever utensils are used in preparing the food. The milk should be obtained from a reliable dairy and should be certified as pure and free from all preservatives. To insure it from spoiling after delivery it should be kept on the ice until needed for use. Mothers or nurses who will neglect these simple precautions cannot be too severely criticised, for they are among the chief sources of our alarming infantile mortality.

Cleansing the Mouth of the Infant.—This is best done by wrapping a small piece of sterilized cotton fibre around the first finger of the right hand, that has been carefully washed with soap and sterilized water, and, after moistening the cotton in sterile water or a saturated solution of boric acid, the finger is introduced and passed over the surface

of the mouth and tongue and particularly under the tongue and between the gums and cheeks, as these are the places where the particles of coagulated milk are usually found. If the child is suffering from a sore mouth, a physician should be consulted at once.

During the early stages of dentition the mouth should be carefully inspected every day to see that there are no ulcerations of the gums at the points where the teeth are making their appearance. If the child cries when attempting to nurse, it is quite certain that some form of stomatitis—sore mouth—is present and that the services of a physician are needed. The small ailments of little children should never be neglected. It is better to have the advice of a competent physician in *these,* as early treatment may prevent a more serious condition.

As soon as the teeth begin to appear they should be kept scrupulously clean. This may be done at first by the method already described. After the teeth have fully erupted, the tooth-brush will be indicated. This should be small in size and the bristles soft. Camel's hair makes the

best bristle for the baby's brush. In applying the brush especial care should be exercised not to bruise or in any way injure the gums, or the mucous membrane of other portions of the mouth, as these tissues at this period are tender and easily abraded.

In the case of infants the cleansing of the mouth twice each day will ordinarily be sufficient. This should be done morning and evening, preferably at the time of the bath. After the teeth have erupted and the child is taking a mixed diet, the mouth and teeth should be cleansed three or four times each day, preferably on rising in the morning and after each meal,—on rising, because the mouth will be found to contain a greater number of micro-organisms, as they have had an undisturbed period of from six to ten hours for growth and propagation. A thorough cleansing of the mouth before breakfast is more essential to good health, in the judgment of the writer, than all other measures of personal hygiene combined.

Persons who suffer from gastric and intestinal indigestion—which is often due to septic conditions transmitted from the

mouth—will soon find marked relief from their distressing symptoms if they observe this rule. They should also visit a competent dentist and have their teeth put in a healthy condition, by having the salivary deposits removed, decayed teeth filled, abscessed teeth treated, suppurating roots removed, and teeth suppurating from pyorrhœa alveolaris—Rigg's disease—treated or removed.

After each meal the teeth are fouled by food débris, which after two or three hours is in a state of fermentation or putrefaction, and acids are formed which attack the enamel and dentine of the teeth, resulting in dental decay. For this reason, if no other, the teeth should be brushed and cleansed after each meal.

The writer has always made it a general practice to instruct his patients in the care of the mouth and teeth. He has often been interrogated by his little patients who thought it something of a hardship to obey the instructions given at home in relation to cleansing their teeth. "Doctor, how often should I brush my teeth?" The question has usually been answered by asking another: "How often do you

wash your face and hands?" "Why, whenever they get dirty." "When do your teeth get dirty?" "Why, I suppose every time I eat anything." "Then you should clean your teeth every time they get dirty; and they get dirty every time you eat anything. This means at least after each meal, and as much oftener as you soil them by food or *candy.*" "Can't I eat any candy?" "Oh, yes! In *moderate degree* it is good for you; but you must clean your teeth after eating it, or you will suffer from badly decayed teeth and a whole lot of other diseases that sometimes result from decayed teeth."

"Can I chew gum?" Certainly! But do not do it in public places. Chewing gum will help to keep your teeth clean, but it will not take the place of the tooth-brush. There is hardly anything that is more disgusting than to see a nice-looking boy or a pretty girl "chewing a cud" in a street-car or other public place. "Grown-ups" who have been well "brought-up" of course need no hints along this line.

Little children should be taught to use the tooth-brush as soon as the imitative faculties begin to develop. This may be

done by the mother or the nurse brushing her own teeth before the child, who has been furnished with an appropriate brush. The lessons, for it will take many, should be carefully and slowly taught, so that the child will comprehend all the movements that are required to reach all parts of the mouth and teeth. The child should be taught to view the teeth in a looking-glass to see if they are clean and compared with those of the mother or nurse. In this way the pride of the child is stimulated and rivalry awakened to have the nicest-looking teeth.

Of course it is not expected that children of three years of age can be taught to care for their own teeth; this must be the duty of the mother or nurse. A beginning, however, can be made at this period, and a habit formed as the months and years go by, that will cling to the child through all after life. The importance of this early training cannot be overestimated, as it insures mouth comfort, good health, and long life, barring accidents. The individual who has been brought up from early childhood to give proper care to the cleanliness of the mouth

and teeth is rendered quite miserable if for any reason he is obliged to neglect even for a single day this brushing of the teeth.

THE MOUTH OF THE SICK CHILD.—At no period in the life of the child is oral hygiene, or mouth cleanliness, of so much importance as during illness. At such time the secretions of the mouth are more or less changed and frequently are decidedly acid in reaction; while the micro-organisms of the mouth are less disturbed than during health, and as a consequence grow and propagate more rapidly. Great damage is often done to the teeth during a short illness from neglect to keep the mouth clean. Of course it should be understood that during a severe illness it may not be possible to carry out a careful and thorough regime of mouth cleaning on account of the disturbance to the child. A little careful cleansing of the mouth and teeth will not be harmful to the general condition of the child at such times, while in a majority of instances it will prove restful and refreshing. The means already described for cleansing the mouths of infants can be employed in these cases with ease.

If sordes—mucous deposits of dark color—form upon the teeth, they can easily be removed with a little stick that has been shaped like a chisel and charged with a little precipitated chalk, and the teeth wiped off with a little cotton moistened in a saturated solution of boric acid.

DENTAL DECAY is often established in the mouths of little children during periods of illness, but much of this can be prevented by a proper care of the oral cavity during these times. As soon as a child has recovered from an illness, its teeth should be carefully examined. This is best done by the family dentist, and, if dental decay has been established in any of the teeth, they should be treated and filled immediately with materials that will arrest the disease and take so little time as not to fatigue the child. Many little children have to receive the attentions of the dentist before they are three years of age. These children should be treated with the utmost gentleness and kindness, so as to make it a pleasure for them, rather than a terror, to have their teeth treated. If the dentist will trouble

himself to gain the confidence of these little ones, he will never have any trouble in handling them.

Toothache and dento-alveolar abscess are not uncommon in little children. Such affections may become a serious menace to the health of the child, either through nervous irritation or septic conditions.

The pain from an inflamed dental pulp or an acute dento-alveolar abscess is very excruciating indeed, as some of our readers may know from a personal experience.

The little child is just as susceptible to pain as the adult, but has not the same physical power or nervous stability to endure it.

CHAPTER IV.

THE HUMAN MOUTH; ITS CARE DURING SECOND DENTITION.

SECOND DENTITION.

After the completion of first dentition at or about the age of three years—the eruption of the crowns only is intended to be expressed—there is a period of rest established so far as the appearance of the second or permanent teeth is concerned. There is, however, during this period very active growth or tooth development going on in the jaws, in the completion of the roots of the deciduous or first teeth, and in the development of the crowns of many of the second or permanent teeth.

The roots of the deciduous teeth are completed in formation at about the following periods and in the order named, but no positive rule can be laid down from which frequent deviations will not be observed:

The central incisors are completed at about the age of 2 years.
The lateral incisors are completed at about the age of $2\frac{1}{3}$ years.
The first molars are completed at about the age of $2\frac{1}{2}$ years.
The cuspids are completed at about the age of $2\frac{2}{3}$ years.
The second molars are completed at about the age of 3 years.

Figs. IV, V, VI show the state of development of the teeth of a child from three to three and one-half years of age.[1]

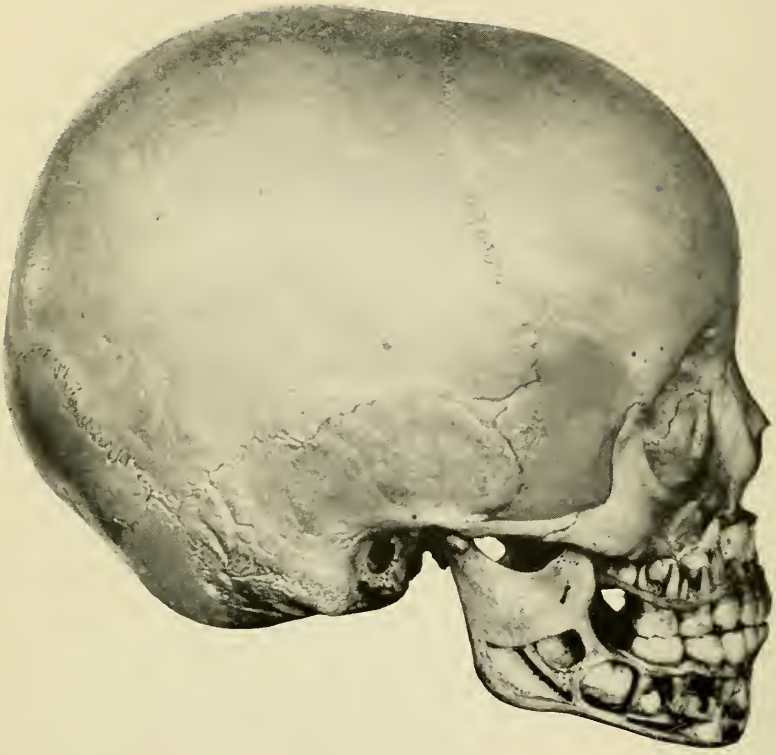
During the period of active development of the teeth the child should be guarded against all undue excitement, exposure, or indiscretions in feeding, as the developmental changes which are going on are taxing the nervous energy of the child to its full capacity. This is the period when nervous affections are most likely to develop, hence the necessity for the caution above expressed.

[1] Photographs from the collection in the Library and Museum of the Surgeon-General, U. S. Army.

Fig. IV.

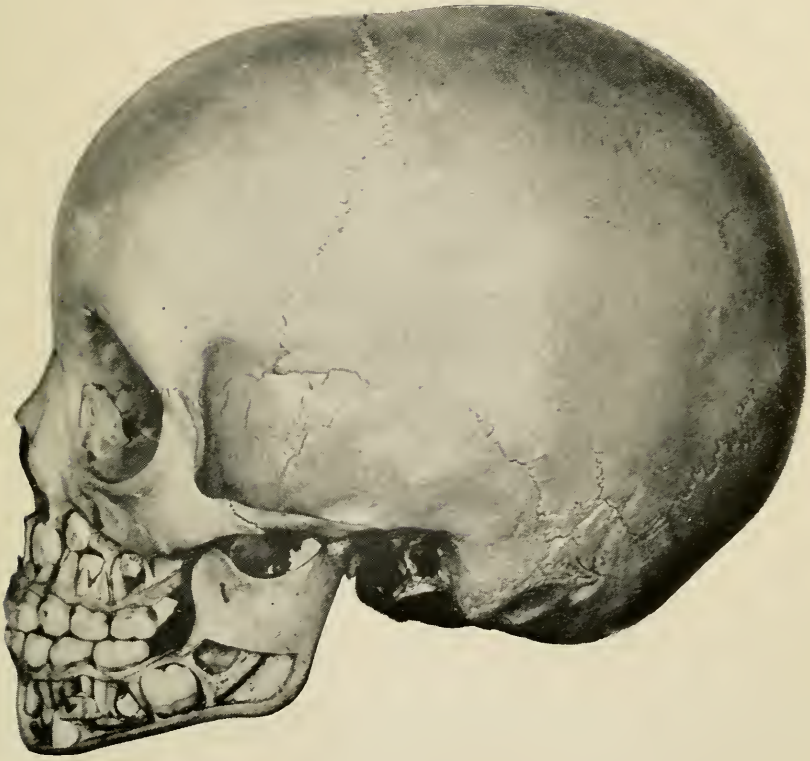
Head of Child, aged 3½ to 4 Years, Front View, showing Complete Primary Dentition and Secondary Dentition in Various Stages of Formation.

Fig. V.



Right Side of Same.

Fig. VI.



Left Side of Same.

ERUPTION OF THE PERMANENT TEETH.[2]

Normal *secondary* or *permanent* dentition begins at about the sixth year by the eruption—cutting—of the *first molars,* which take position behind the second deciduous—milk—molars, the growth of the jaws having made this possible by increasing the distance between the second deciduous molar and the ascending ramus — upright portion — of the lower jaw, and between the same tooth and the tuberosity—rounded termination—of the upper jaw.

The growth of the jaws, which keeps pace with the eruption of the permanent teeth, is mainly confined to an elongation of the horizontal ramus of the lower jaw—the portion containing the teeth—between the second deciduous molars and the angle. There is also a certain amount of growth taking place at the symphysis—median line of the chin—and in the upper jaw at the median and intermaxillary sutures—median line of the upper jaw and a lateral line passing between the lateral incisors and cuspid—miscalled eye-

[2] Marshall's Operative Dentistry, third edition, p. 79.

teeth—and also in the interstitial substance—body of the jaws.

In this connection it will be well to state that, during the process of eruption of the permanent teeth of the child, the family dentist should be frequently consulted, so that he may correct at the earliest moment any tendency to a malposition of the teeth. It is a mistake to postpone such operation until the teeth have all erupted, as used to be recommended not long ago.

The first permanent molar has the misfortune frequently to be considered, or rather mistaken for, a deciduous or milk tooth, and, because of the mistaken notion of many otherwise intelligent people, that the first teeth should receive no dental attention because they are only temporary organs soon to be lost by a natural process, these teeth (the first permanent molars) are often allowed to decay, until they are past saving by any means known to the dentist, and have to be extracted. A greater crime against the dental perfection of the child could not be committed, and the writer wishes he could proclaim this fact from the house-tops.

The first permanent molars are the keystones to the dental arches, and when they are extracted the perfection and symmetry of the arches are ruined, the teeth assume irregular positions, resulting in malocclusion and more or less loss of the masticatory function.

Children whose first permanent molars have been neglected until they are badly decayed have usually bad digestion, because these teeth have been so sensitive or painful as to make proper mastication impossible, hence the food has been swallowed before it has been properly triturated and mixed with the saliva, thus producing indigestion, malassimilation, headache, general nervous irritability, and sluggish minds. Children of this class make up the large majority of the " backward " children in our public and private schools. Furthermore these children have suffered very considerably in a large majority of cases from toothache, or abscessed teeth and swollen faces, which have robbed them of sleep and rendered them nervous, peevish, ill-tempered, or positively ill; and this many times with little or no sympathy from those responsible

for the upbringing of the child, and who have, through ignorance of the conditions and the real, vital suffering through which the children have passed, considered it as one of the children's troubles that must be endured. Or, when the cries of the child have so disturbed the sleep of the household that " endurance was no longer possible," the little sufferer has been hurried away to the dentist and the tooth removed.

The following table gives a fairly correct idea of the time and the order in which the eruption of the permanent teeth takes place.[3] These figures are subject to slight variations to suit the individual case:

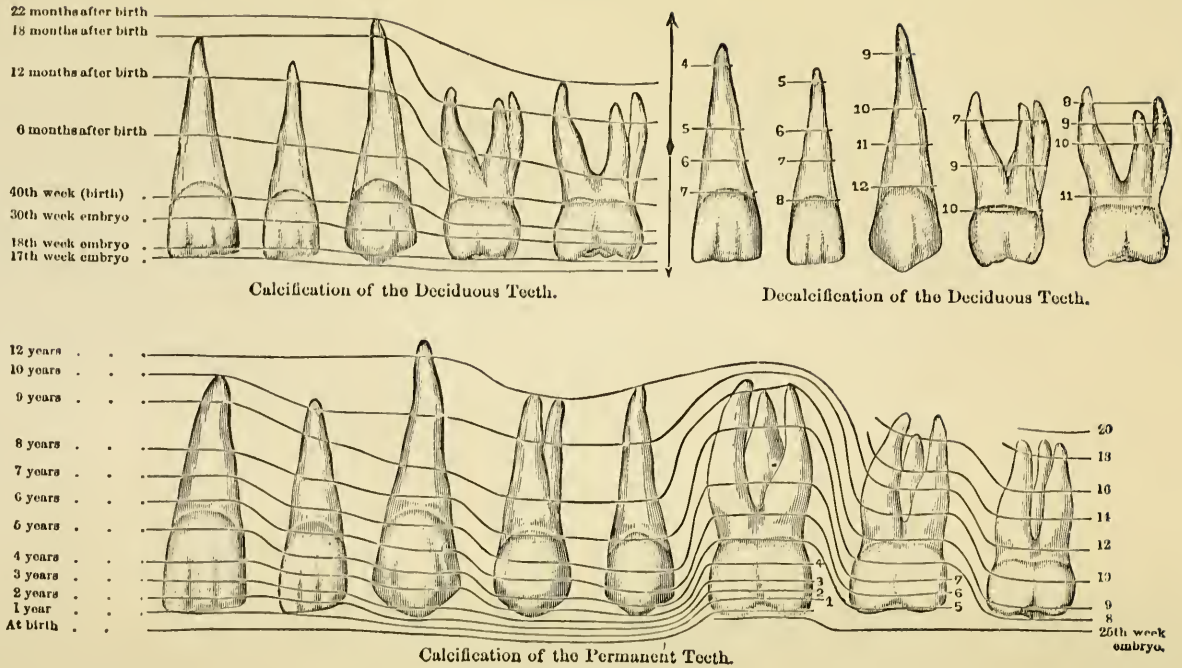
First molars	5	to	7	years of age.
Central incisors,	6½	to	8	years of age.
Lateral incisors,	7	to	9	years of age.
First bicuspids..	9	to	11	years of age.
Second bicuspids,	10	to	12	years of age.
Cuspids	11	to	14	years of age.
Second molars ..	11½	to	13	years of age.
Third molars ..	16	to	21	years of age, or at any period later.

[3] Marshall's Operative Dentistry, third edition, p. 81.

Fig. VII

Adult Head, showing Complete Secondary Dentition. (After Cryer.)

FIG. VIII.



Calcification of the Deciduous Teeth.

Decalcification of the Deciduous Teeth.

Calcification of the Permanent Teeth.

" The third molars not infrequently fail to appear at all. They are usually developed, but remain in their crypts in the jaws for lack of space in the dental arch to accommodate them, or are so malposed that their eruption is difficult or impossible."

The lower teeth usually precede the upper ones of the same class two or three months, but this rule is subject to variation.

SHEDDING THE DECIDUOUS TEETH.

The exuviation or shedding of the deciduous or milk teeth is a peculiar physiologic process—resorption—which causes a gradual dissolving or melting away of the roots of the teeth until nothing is left but the crown, which, from lack of further attachment to the jaw and gum, falls out.

This process begins in the central incisors in about a year or a little more after the complete formation of their roots, Figs. VII, VIII,—viz., in the middle or latter part of the third year,—but is not completed until about the seventh year, when the crowns fall out from lack of sup-

port, and the permanent central incisors take their place. Although these teeth are considerably wider than those which they replace, the compensating growth of the jaw has been such that there is usually room for them to take their normal position. The lateral incisors are attacked a few months later and are shed at about seven and one-half to eight years of age, the permanent laterals immediately taking their place. The process begins in the first deciduous molars at the age of six and one-half to seven years, terminating at about the tenth year; they are replaced by the *first* permanent *bicuspids.* The second molars are attacked at from six months to a year later, the process being completed at about the eleventh year, and are replaced by the *second* permanent *bicuspids.* The cuspids are usually the last of the deciduous teeth to be shed, although many instances will be observed in which they will be shed before the second molars. The process begins in the cuspids at about the eighth year, and is not usually completed until the twelfth year or even later. These teeth are replaced by the permanent cuspids. The

location and eruption of the *first permanent molars* have already been described as situated directly behind the second deciduous molars and they are the most important teeth in the permanent dental arch. These teeth being members of the permanent denture are never shed, which is a fact that should be more definitely fixed in the lay mind, if the children who are born in the future are to maintain a normal symmetry of the dental arch and of the face.

At about the twelfth year of age the *second permanent molars* are erupted directly behind the first permanent molars, and at the sixteenth to the twenty-first year of age the *third permanent molars*—miscalled wisdom teeth—take their place directly behind the second permanent molars, thus completing the normal adult dental apparatus.

THE CARE OF THE PERMANENT TEETH.

This, *primarily,* is the consideration of all those means which may be employed to prevent diseases of the teeth and the mouth, and, *secondarily,* of those means, medical, surgical, and mechanical, which

are employed to cure disease and to restore parts that have been lost by disease, accident, or by design. The former only will come within the province of oral hygiene, and is, therefore, the only branch of the subject which will be considered in these pages.

The highest aim of the healing art is not the *cure* of disease, but *its prevention.* The Chinese high-class people employ their physicians by the year to keep them well, to prevent sickness. When any member of the family is ill, the pay stops—the doctor has been derelict in his duties.

The highest aim of the dentist should be to prevent the development of disease within the oral cavity, and to check its ravages at the earliest possible moment, so that the attendant dangers may be reduced to the minimum. In order to accomplish this much-to-be-desired result, frequent examinations of the mouth and teeth at stated intervals, with explicit instructions in the various means which may be adopted to keep the mouth and teeth in an hygienic condition, will be absolutely necessary.

The system of frequent periodical examinations, to be most effective, should be instituted in early life, commencing with the little children as soon as the deciduous teeth have erupted. In the families of the well-to-do and the rich, there is no difficulty in the way of its accomplishment as soon as they appreciate its value as a health-giving practice. Not so with the respectable poor and indigent, or the children of the slums, who, because of the poverty or ignorance, or both, of their parents, rarely or never receive such attentions.

It is hoped, therefore, that the movement to establish free dental clinics for the benefit of the indigent poor may, in the light of our advanced and more intelligent appreciation of oral hygiene as a public-health measure by the official and the general public, prove successful, and that the care of the mouth and the teeth may become as fully recognized as a beneficent service as is now the case when illness brings this same class of people to our public hospitals and sanitariums. Free dental clinics might be established as out-patient departments in every pub-

lic hospital and sanitarium in the country with but little additional expense to the public treasury. The establishment of the great Forsyth Dental Infirmary in Boston, Mass., is a most magnificent charity, and we hope is only the forerunner of many like enterprises that will be established by wealthy and philanthropic people. The poor and needy are always with us, thus making our duty plain.

Every child that is born into the world has the right given of God, to be born with a healthy body, a healthy mind, and healthful moral tendencies. It also has the right to be protected from diseases and deformities of body and mind and from moral degradation. If parents fail in these duties, then the responsibility rests with the State. In some instances this responsibility is recognized and the children protected against the ignorance, the indifference, the cupidity, or the inhumanity of the parents or guardians. The medical inspection of the public-school children, recently organized and put into operation in several of the States, is a recognition of this obligation. But it must go much further than at present

contemplated, and should provide medical, surgical, and dental treatment for such children as need it, and whose parents cannot afford to pay the expense of such treatment, while, upon the other hand, those who can afford it should be compelled by stringent law to do so. The law compels a father to provide food and clothing for his children; why not, then, proper medical, surgical, and dental treatment?

PHYSICAL DEFECTS TEND TO MORAL ABERRATIONS.

Many a child becomes ill-tempered, morose, cruel, quarrelsome, vindictive, and untruthful because of the constant irritation of physical defects, not the least of which are irritations from dental and oral diseases and malformations. Many a child goes wrong morally when it discovers it is physically deficient or deformed. A crooked disposition often goes with a crooked back.

An irregular set of teeth, a malformed jaw, a hare-lip, or a cleft-palate often destroys the happiness of a sensitive child

by making him the butt of ridicule of his associates, and psychologically tends to pervert an otherwise sweet and loving disposition, turning it into one in which hatred and vindictiveness are its leading characteristics.

The State cares for the blind, the deaf and dumb, the imbecile, the epileptic, and the crippled children. Why should it not care for these other children and give them a fair chance in life?—a fair chance to become healthful, self-respecting, and noble citizens.

Nearly every state that has established medical inspection of the public-school children, including the District of Columbia, has included dental inspection.

The school dental clinics so far established have, as a rule, been supported by volunteer subscription and service on the part of philanthropic people, dental societies and individual dentists.

THE NEED OF MOUTH CLEANLINESS.

Cleanliness of the mouth and teeth is the greatest of all prophylactic measures which can be instituted against dental decay.

This statement needs no verification, for it should be patent to every one of even limited observation that dental decay rarely ever occurs upon the smooth surfaces of the teeth which are fully exposed to the friction of foods in mastication and the cleansing action of the tongue, lips, cheeks, and the oral secretions.

The prevention of dental decay should therefore be directed to securing as nearly as possible *perfect cleanliness* of the mouth, for this implies the removal and destruction of zymogenic—ferment-producing—micro-organisms of the mouth, which are the local cause of dental decay, together with their acid products and all fermentable material.

Children should be early taught the value and the necessity of keeping their teeth clean. But this is not always an easy task to accomplish, for usually it is incomprehensible to them. It therefore becomes necessary in most cases to adopt some other means to accomplish the end. Sometimes it may be done by stirring up a spirit of rivalry among the children of the family or between mother or nurse and the child, as to who will have the cleanest

looking teeth every day. Or it may be necessary to stimulate the pride of the little one to have the cleanest and nicest looking teeth of any member of the class at school. On the other hand it may be sufficient to call the attention of the child to a picture, such as that of Fig. IX, which shows a dirty mouth and teeth, and then compare it with Fig. X, which shows a clean and healthy mouth. Pictures often produce a most vivid and lasting impression upon the mind of a child and are therefore often more valuable in teaching a lesson and impressing a truth than any other methods that may be employed.

The human mouth is the habitat of large numbers of bacteria, as already stated upon a previous page. The non-pathogenic bacteria make up the bulk of these organisms. Pathogenic bacteria are really few in number but all or nearly all of them are found in the mouth, even in a clean mouth, but they are always much more abundant in an unclean or dirty mouth.

The value of *perfect oral cleanliness* is not generally understood or appreciated by the public. Most people brush their

FIG. IX.

Showing Unclean Mouth and Teeth.

FIG. X.

Showing the Same After the Teeth had been Cleaned and Polished.

teeth for purely cosmetic reasons, not to prevent disease. It therefore becomes the duty of every dental practitioner so to instruct his clients in the need of oral hygiene as a preventive measure against disease, and the means by which they may secure this condition, that they will fully appreciate its value, and intelligently strive to carry out the instruction in all of its details.

These measures should consist of:

First. Instruction to parents and nurses in the proper care of children in relation to the general measures of hygiene—food, clothing, exercise, breathing, the value of pure air in the nursery and plenty of it—that the best possible development of the whole body, and consequently of the dental organs, may be secured.

Second. In such a regular and systematic mechanical cleansing of the teeth and the mouth that the acid-producing bacteria and the fermentable substances upon which they grow may be thoroughly removed, or reduced to the minimum.

Third. By prohibiting or so limiting the consumption of such foods and con-

fections as furnish the material for acid formation, that the chief source of lactic acid may be eliminated or greatly reduced.

HOW TO CLEAN THE TEETH.

A good brush, a spool of floss silk, a tongue-scraper, and plenty of pure water are all that are needed, ordinarily, for cleansing the mouth and the teeth. Tooth-powders or pastes may sometimes be necessary to keep the teeth bright and clean; but when the individual habitually brushes the teeth three or four times each day, powders and pastes are unnecessary. When the teeth are neglected, and brushed only occasionally—for instance, when going out to dine or to spend the evening—dentifrices will most likely be needed and plentifully applied to make the teeth look passably respectable and partially to correct the accompanying unwholesome *fetid* breath.

In using the tooth-brush the teeth should be brushed both crosswise and up and down—that is, in the direction of the long axis of the teeth,—with a rotary

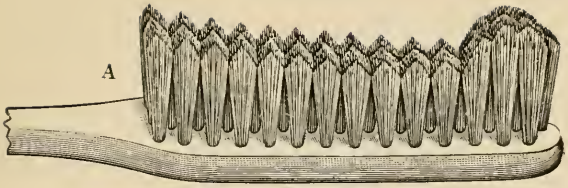
motion, from the gums to the free ends of the teeth. This rotating motion permits the bristles of the brush to pass between the dental interspaces of the teeth and removes the particles of food that have lodged in or have been forced into these spaces. These are the locations most frequently attacked by decay. All the surfaces of the teeth can be reached with a properly shaped tooth-brush (Figs. XI and XII). A brush of this form permits every tooth to be reached, including the last molars, and the surfaces of the teeth next to the tongue and the roof of the mouth. Tooth-brushes are usually made in three grades, " soft," " medium," and " hard." The " medium " brush is best for general use. The " soft " brush is usually too soft to be effective in removing the food from the interdental spaces, as the bristles double up instead of passing into the interspaces; while the " hard " brush is frequently harmful to delicate gums, by reason of the fact that the bristles are so stiff and wiry as to cause abrasions and bleeding, and this invites infection and often is the starting-point of an acute stomatitis.

THE CARE OF THE TOOTH-BRUSH.—It is important that the tooth-brush be kept in a sterile condition, that all danger from infection may be obviated. This may be accomplished in the *home* with little trouble. The brush should be carefully washed after using, with clean water, and then immersed in ethyl alcohol. A glass jar or bottle of suitable size, fitted with a screw top, is the best form of container for the purpose that has been found, and does away with the necessity for boiling the brush.

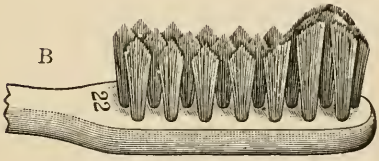
In a neglected and unclean mouth the gums are often in a state of considerable congestion and inflammation; under such circumstances the softest brush will cause hemorrhage, but after a time, if the brushing is persisted in, the tendency to hemorrhage will cease, and the gums will assume a healthy appearance, provided the salivary deposits—tartar—have been removed and the surfaces of the teeth properly polished.

FLOSS SILK is now put up in very neat little containers (Figs. XIII and XIV) suitable for the toilet table, or to be carried in the vest-pocket or in the chatelaine.

Fig. XI.

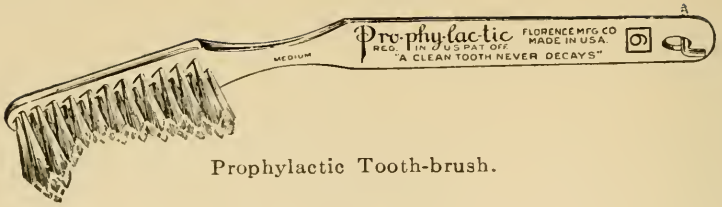


Watkins Adult Tooth-brush.



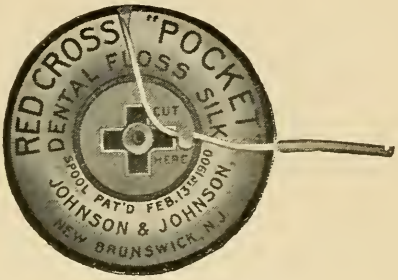
Watkins Child's Tooth-brush.

Fig. XII.



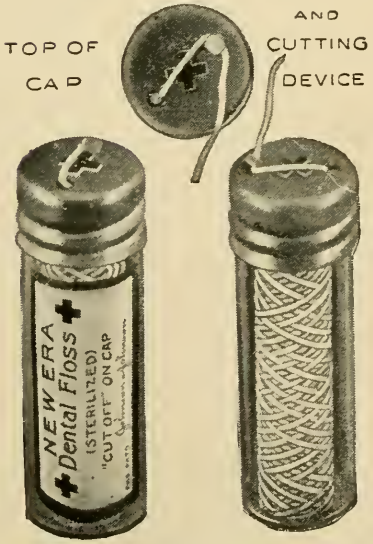
Prophylactic Tooth-brush.

Fig. XIV.



Floss Silk Holder.

Fig. XIII.



Floss Silk Holder.

The use of "SILK FLOSS" as an adjunct to the tooth-brush is of great value in cleansing the dental interspaces of such particles of food as the tooth-brush has failed to remove. The silk should be first waxed and then cut in pieces six to eight inches in length, and these passed between the teeth, the ends crossed, and by a backward and forward movement made to pass over the approximating surfaces of the teeth from the gums to the cutting edges or the grinding surfaces. Care should be used not to wound the gums by forcing the silk upon them with too great energy.

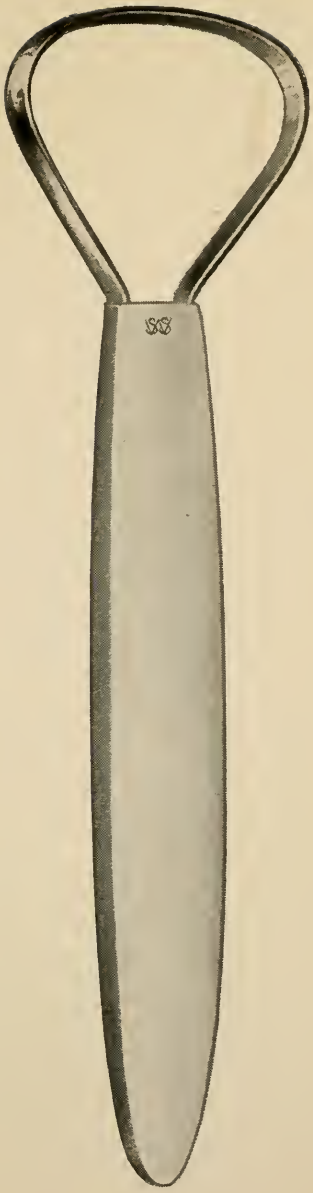
TOOTH-PICKS are also useful in removing food débris and vegetable and animal fibres that have been forced between the teeth and are impinging upon the gums. Such masses of food should never be allowed to remain impinging upon the gum for a longer time than one can reach a convenient place for their removal, as great injury may be done to the delicate festoon that fills the base of the dental interspace and gives to the gums their beautiful symmetry. The loss of the gum festoons gives the appearance of age or senility to the teeth; they should therefore

be protected from injury and loss. Unskillful use of the tooth-pick is often very harmful to the gum festoons, and for that reason it should be rarely used. Metal tooth-picks are unpleasant to use, especially if the individual has metal fillings in the teeth, because when two dissimilar metals come together in the mouth a galvanic shock is the result; furthermore, they can rarely be made thin enough to pass properly between the teeth. Wooden tooth-picks are an abomination, for they are too thick and clumsy to enter the dental interspaces, and they often break off between the teeth or split and leave slivers in the gums that cause inflammation, suppuration and sometimes sepsis.

The only tooth-picks that should be used in the mouth are thin, sterilized quills, made from suitable feathers. These can be used without injury to the tissues, and, if scraped thin enough, will readily pass between the teeth; while they are sufficiently rigid to remove vegetable and animal fibres that may have lodged between the teeth.

THE TONGUE is often in a very unsanitary condition. This organ should receive

Fig. XV.



Tongue Scraper.

as much attention as is given to the teeth to keep them clean. The dorsum—upper surface—of the tongue is supplied with numerous minute papillæ and tiny grooves or depressions surrounding them, which are the lodging-places for particles of food débris and are the breeding-ground for vast numbers of micro-organisms. The dorsum of the tongue should be cleaned every morning by scraping with a suitable instrument made of ivory, bone, or celluloid. This instrument, known as a tongue-scraper, is shown in Fig. XV. It is about six inches in length and has a loop or bow at one end. In using this instrument, it should be carried well back in the mouth, to the root of the tongue, and then drawn forward upon the surface to the tip of the organ. This should be repeated several times. The Japanese provide a tongue-scraper with every tooth-brush sold. This would be a good practice for all tooth-brush manufacturers to adopt. The tooth-brush may be used for the same purpose, but it is inferior to the scraper and less comfortable to use.

The writer has occasionally lost a client

by his insistences that greater care must be exercised upon the part of the individual in keeping the mouth and teeth clean if he is to be retained as the dental attendant, or because he declined to act the part of a scavenger for the removal of such accumulation as could be easily gotten rid of by the use of the tooth-brush before presenting for treatment.

Many ladies who are pinks of perfection and neatness in their toilet, wear beautiful clothes, and expensive diamonds and pearls about their necks, are wofully negligent of mouth cleanliness, neglecting the pearls within their mouths until they turn black and unsightly from neglect and disease—through an unreasoning fear of dental treatment—and constantly carry about with them conditions infinitely more dangerous to their individual health and more disgusting to their associates than the sight and smell of an open sewer.

MOUTH-WASHES.

These agents are of little value except as toilet articles. They have little or no inhibitive effect upon the micro-organisms that inhabit the mouth. An antisep-

tic of sufficient strength to inhibit the growth of any mouth bacterium would prove so irritating to the mucous membrane that it could not be borne. The only real value of a mouth-wash is to assist in keeping the mouth clean, in conjunction with the tooth-brush, to correct or disguise an offensive breath, or, by its cooling and detergent effect, to allay an inflammatory condition of the mouth induced by neglect or disease. As a means of preventing the growth of mouth bacteria or of preventing decay they are "a delusion and a snare." Mouth cleanliness, produced by mechanical means, is the only preventive of these conditions. The mere rinsing of the mouth with fluids does not, and cannot, remove the food deposits left upon the teeth after mastication.

Clean teeth do not decay.—A clean mouth and a clean body are the best safeguards against disease. Guard well the health of the mouth and the stomach will take care of itself. Keep the mouths and teeth of the children in a clean and healthy condition and the undertaker will call less often at your door.

CHAPTER V.

THE HUMAN MOUTH; ITS CARE DURING ILLNESS.

At no time in the history of the individual is the proper hygienic care of the mouth of so much importance as when suffering from severe and prolonged illness; especially the continued and intermittent fevers, tuberculosis, acute articular rheumatism, nervous prostration, and during pregnancy and lactation.

During these periods there is always a marked change in the character of the oral secretions: instead of being neutral in reaction they are almost invariably acid, while the patient will often complain of a "bad taste in the mouth." These conditions are due to perverted nutrition, faulty metabolism and the action of the mouth bacteria.

Rapid dental decay, gingivitis—inflammation of the gums—and stomatitis are common complications, or rather sequelæ, of severe illness.

Rapid dental decay is almost always

a concomitant affection of typhoid fever and rheumatic fever. The same condition is also very frequently associated with pregnancy and lactation. These facts are well known to dental surgeons, and many cases might be cited to substantiate the statement.

By way of illustration, the writer will briefly describe three typical cases from his own practice:

Mr. J. K., aged 19 years, in the best of health, had his teeth put in good condition before entering college. He had had but little dental decay; always from early childhood had taken nice care of his teeth and mouth. Was considered by the writer as one of his *banner* patients. Two months after entering college, he was stricken with typhoid fever in a severe form. Three months later he returned to his home to convalesce, and at once reported complaining of sensitiveness of the teeth and of decay. Upon a critical examination, fourteen cavities of decay were found, located at the gum margins and upon the approximal surfaces.

Miss E. L., aged 14 years, of robust health, had beautiful and almost perfect

teeth, with very few fillings. Mouth carefully examined just before sailing for Paris to enter a fashionable school. Six months later was stricken with inflammatory rheumatism, and for several weeks her life hung in the balance. Upon recovery she visited a noted Paris dentist for relief of very severe pain and decay at the gum margins of nearly all her teeth. Only temporary treatment was given her at this time, as her parents were to bring her home as soon as strong enough to make the ocean voyage. She, however, suffered a relapse and died in Paris.

Miss H. C., aged 25 years. Milliner by occupation; health had been good. Teeth were in good condition and regularly cared for. Had a number of fillings, all in good condition at last visit. Soon after was stricken with pneumonia and was desperately ill and made a slow recovery. Acute pulmonary tuberculosis developed before she was able to leave her room, and from which she died six months later. During the last four months of her illness her teeth were attacked with rapid decay, which affected nearly every

metal filling in her mouth and established several new cavities, necessitating many visits to her bedside to give her relief from pain.

In nearly all abnormal affections and conditions the salivary secretions are hyper-acid, and as a result of this the teeth are particularly prone to rapid dental decay. The same is true of children suffering from severe and prolonged cases of scarlet fever, diphtheria, measles, and gastro-intestinal affections. The writer also observed while on duty in the Philippine Islands that our soldiers afflicted with amœbic dysentery and sprue were very prone to rapid dental decay.

The signs of rapid dental decay are a whitening of the enamel at the cervices—necks—of the teeth at the gum margins, giving a chalky appearance to this portion of the teeth, a whitened or chalky zone around present cavities of decay, and the formation of chalky appearing zones upon the approximating surfaces of the teeth at the points of lateral contact.

Gingivitis, or inflammation of the gums, is usually due either to an unclean condition of the mouth, causing an in-

fection, the presence of salivary calculus—tartar—or to a faulty metabolism.

Stomatitis, or inflammation of the mouth, is generally due either to infection from an unclean mouth, to local irritation from substances taken into the mouth as food or remedies, or to the action of drugs, such as mercury, iodine, and the mineral acids, which have been exhibited for systemic purposes.

THE CARE OF THE MOUTH OF THE INVALID is a subject of great importance from both the *hygienic* and *curative* standpoint.

The first consideration in prophylaxis, or prevention, is *cleanliness.* This applies with equal force to medicine, surgery, and sanitation. It is the sheet-anchor of success in all of these departments of science.

The oral hygienist must therefore base his expectations for success upon *cleanliness of the mouth,* first, last, and all the time.

The physician insists upon the daily bath of all his patients, suited of course to their particular case. The surgeon not only requires this, but insists that the part to be operated upon shall be

rendered *surgically clean*—germ free—which is a much more exacting proposition than ordinary cleanliness. The dentist also requires that the tooth upon which he operates shall be surgically clean, and this he accomplishes by isolating the tooth with sterilized rubber dam and treating the tooth with antiseptics.

The oral hygienist cannot, however, carry his efforts in cleanliness to the extreme required by the surgeon and the dentist; neither is it necessary in order to accomplish the success for which he is striving.

The fact remains that in the mouth which is free from food débris, accumulations of salivary calculus, decayed teeth, or diseases producing suppurative products, the fluids of the mouth have no auto-infective properties. In other words, the secretions of a clean, healthful mouth are physiologic products, although they may contain several species of mouth organism and be infective to another individual. Wounds, even of an extensive character, made in a clean mouth almost invariably heal without inflammation or other untoward accompaniment.

In the case of the mouth of the invalid who has been accustomed, previous to the present illness, to give proper attention to the cleanliness of the mouth and dental treatment, there are no difficulties that may not be overcome with tact and patience. In even the most desperate cases, where the temperature is running high and the mouth, tongue and lips are dry and parched, a gentle cleansing of the mouth is most soothing and grateful to the patient and eagerly sought thereafter; and, instead of being disturbing and harmful to the invalid, proves restful, as is often shown by being followed by refreshing sleep. It is not always possible to employ the tooth-brush and water for cleansing the mouth, as the patient may be too weak to sit up or even to turn over on the side to eject the water from the mouth. Under these circumstances the mouth may be effectively cleaned by first wiping the teeth with a piece of sterile gauze, wrapped upon the first finger of the right hand or upon an orange-wood stick—the finger being preferable for many reasons which are obvious—moistened in a two per cent.

solution of carbolic acid or a saturated solution of boric acid. Then with the orange-wood stick, flattened at one end and wrapped with a few fibres of sterilized cotton, carefully rub the surfaces of all the teeth with a twenty-five per cent. solution of hydrogen peroxide (12 volume), completing the cleaning of *one* tooth at a time. The foam which is caused by the effervescence of the hydrogen peroxide in contact with the fluids of the mouth may be wiped away with pieces of gauze moistened in orange water. This cleansing will usually prove so grateful and refreshing to the invalids that they will look forward to it with pleasureable anticipations.

The cleaning of the tongue is a very important matter in all cases of severe illness, especially when the tongue is constantly covered with a thick, heavy deposit—*fur,*—the result of rapid and undisturbed growth of micro-organisms. In these cases the tongue-scraper will be an invaluable aid to a proper cleaning of this organ. The tongue should be carefully wiped afterwards with a piece of sterilized gauze moistened with a saturated solution of boric acid for its cleansing effect.

The cleansing of the tongue, aside from its prophylactic value, is a matter of great comfort to a patient with a high temperature, and should never be neglected when it is possible to accomplish it without too much disturbance of the patient.

On the other hand, with a patient who has never given any particular attention to the cleanliness of the mouth or to dental treatment, in which salivary calculus is present in considerable amount, dental decay rampant, several teeth with discharging abscesses, or suppurating sockets from pyorrhœa alveolaris—Riggs's disease—many difficulties are presented; difficulties which cannot be overcome except by a dentist or a dental nurse trained for this particular service. There is great need in all our hospitals and sanitariums for nurses of this character,—genteel young women who have received special training to fit them to take charge of general mouth hygiene, to remove salivary calculus, relieve pain from exposed pulps, treat abscessed teeth and other suppurative conditions of the mouth under the direction of the dental attendant.

Except in *very* uncleanly and *badly*

diseased mouths, the nurse will be able to render considerable relief and give much comfort to her patients by following the régime just laid down.

As soon as a patient is strong enough to sit up in bed, the tooth-brush should be used, rinsing the mouth with sterile water or a saturated solution of boric acid flavored with orange water for its refreshing effects.

It is never wise to prolong the process of mouth cleansing to the point of causing fatigue, as this would be harmful. Gentleness of touch, dexterity of manipulation, and a sympathetic manner will soon allay all nervous apprehensiveness upon the part of the patient; for it is a peculiar fact that most people have a nervous dread of dental manipulations.

In the treatment of mouths affected with rapid dental decay from the hyperacid condition already mentioned, the deleterious effects of the acids upon the teeth may be counteracted by the frequent use of alkaline or antacid solutions, such as bicarbonate of soda, one teaspoonful to half a glass of tepid water, or milk of magnesia, one tablespoonful to half a

glass of tepid water, or lime water in the same proportions.

Pregnant and nursing women cannot be too careful about their mouth conditions, as their teeth are prone to dental decay during these periods. The old saying among midwives, which goes back to the early history of civilization, " For every child a woman bears she loses a tooth," though not absolutely true, is based upon the observed fact that during pregnancy and lactation dental diseases are much more prevalent and serious than during other periods and that teeth are frequently lost during these periods. Perverted oral secretions, gastric indigestion, malnutrition, and faulty metabolism or disturbance of function of the ductless glands affecting the calcification of the bones and the teeth, are doubtless the underlying causes.

Many of these women suffer from inflamed and bleeding gums. This is in all probability due to plethora of the upper part of the body induced by the known increase in the volume of blood during pregnancy, and by impeded circulation resulting from the pressure of the gravid uterus upon the descending aorta.

Pregnant women should protect themselves against the loss of their teeth by frequent visits to the family dentist. No woman who can prevent it should allow herself to approach the lying-in period with her mouth in an unclean or diseased condition, as septic conditions of the mouth are exceedingly dangerous to the lying-in woman. Many accoucheurs are now so impressed with this fact that they insist upon their patients having all septic teeth rendered sterile by proper dental treatment or extracted before the lying-in period, or refuse to be held responsible for the after results if sepsis follows parturition. Many surgeons dislike to operate, especially in abdominal cases or general non-septic cases, until the mouth and teeth have been carefully inspected for septic conditions, and, if present, cured or removed.

Only a few years ago no such thought was given to the *possible dangers* to the success of a delivery or of a surgical operation *from a septic condition of the mouth.* These facts are becoming more and more widely recognized by the profession, and with corresponding benefit to suffering humanity.

Pregnant and nursing women fre-

quently complain of excessive sensitiveness of their teeth to changes of temperature and to sweets and acids. This condition is usually due either to an unclean condition of the mouth with acid fermentation of food débris or to dental decay, either superficial or progressive in its character. This may be overcome by thorough cleanliness of the mouth, the treatment and filling of the decayed teeth, and the use of bicarbonate of soda, milk of magnesia, or lime water as indicated on a previous page.

CHAPTER VI.

PROPER MASTICATION AND PROPER BREATHING.

THE PROPER USE OF THE TEETH AND MOUTH IN MASTICATION.

THE American people can rightfully be charged with *two great sins* against physiologic living: First, that of *bolting* their food, insufficiently masticated and inadequately mixed with the natural secretions of the mouth; second, that of drinking large quantities of *iced water* with their meals. Two greater handicaps to a normal digestion could not have been invented, even by the evil one himself.

Insufficient mastication and inadequate insalivation of food place work upon the stomach which should have been performed by the teeth and the salivary fluids. Drinking iced water chills the stomach contents and retards digestion. As a result of these two vicious habits, we are fast becoming *a nation of dyspeptics,* whose minds are filled with pessimistic ideas and who are doing much to sour

the milk of human kindness by our sombre views of life.

No man, woman, or child can be optismistic in their views of life, or be good-natured and happy in mind or physically full of life and energy who has a disordered dyspeptic stomach.

Bolting the food improperly masticated is, however, not always the result of the *hurry-up habit* which so afflicts the average American; but is often due to decayed and sensitive teeth with exposed pulps, which make mastication a torture, or to teeth loose and sore from abscesses or from pyorrhœa alveolaris, or from a loss of so many teeth as to make mastication impossible. In the latter case this deficiency can be corrected by the insertion of artificial teeth; while the former conditions may be cured or greatly mitigated and relieved by appropriate dental treatment, and the adoption of a suitable hygienic regime, such as the one already outlined in a preceding chapter.

Hygienic living, beginning with a clean and healthful mouth and proper mastication of food, will soon cure dyspepsia and banish many other ills that are only reflex

symptoms dependent upon the disordered stomach.

Dr. Gustave Fuetterer,[1] in an article on "Round Ulcer of the Stomach followed by Carcinoma," says that this form of ulcer located at the pyloric orifice of the stomach becomes carcinomatous through irritation caused by rubbing or friction from particles of improperly masticated food, such as crusts of bread and hard or crispy portions of fried or baked meats. Proper mastication, therefore, is a very important prophylactic measure against ulceration and carcinoma of the stomach.

What is *proper mastication?* This question is often asked, and may be tersely answered in the words of the "Grand old Man" William E. Gladstone, late Prime Minister of Great Britain. Being asked to what he ascribed his robust health and long life, he replied, "To thorough mastication of my food." When asked what he meant by *thorough mastication,* he replied, "Nature has given me thirty-two good teeth, so I aim to give every morsel of food that enters my mouth thirty-two bites." A better answer to this question could not be found.

[1] Journal American Med. Asso., March 15, 1902.

Mr. Fletcher, the American Apostle of Right Living, says, "All food should be masticated until it is practically liquefied before it is swallowed." Such mastication or trituration of the food places it in the best possible condition to be quickly acted upon by the digestive fluids of the stomach, thus preventing fermentation and the production of ptomaines—poisonous products of decomposition.

When food is swallowed imperfectly masticated and improperly mixed with the oral fluids, fermentation is soon established, with the formation of malodorous gases, which cause discomfort or pain, and constantly annoy the sufferer by being belched from the mouth; or ptomaines are formed from decomposition, producing septic inflammation of the stomach and bowels, with diarrhœa. Shakespeare says, "Appetite waits on good digestion." But we may go a step further and say, good assimilation waits on good digestion, and good health on good assimilation.

PROPER METHOD OF BREATHING.

Children should be taught early in life correct methods of breathing. Many

children habitually breathe through the mouth, simply because they have not been taught to breathe through the nose, and not because there are any obstructions in the nasal passages. On the other hand, many children are forced to breathe through the mouth because of narrow or obstructed nasal passages or abnormal growths in the upper pharynx. When a child cannot breathe freely through the nose, the attention of the physician should be immediately called to this condition and proper treatment undertaken at once.

A child who habitually breathes through the mouth will almost certainly be dull mentally, irritable in disposition, have frequent attacks of sore throat, tonsillitis, severe colds and bronchitis, and will be predisposed to pulmonary diseases.

Associated with abnormal growths in the nasal passages there will be found almost invariably a narrow V-shaped or saddle-shaped upper jaw, which contracts the nasal passages and makes nasal breathing difficult, even without the obstructions. If, as sometimes happens, this is complicated with a deviated septum—

inner division of the nose—the condition is a serious one and calls for a consultation with a nose and throat specialist and a dentist, preferably an orthodontist—one who regulates the teeth. The work of the nose and throat specialist will be to clear the nasal passages of abnormal growths or conditions; that of the orthodontist will be to expand the dental arches and bring the teeth into a proper alignment and normal occlusion, and by so doing expand the nasal passages, thereby giving the patient a normal breathing space.

Children may be taught to breathe correctly by having them stand erect, with the shoulders thrown back, and the lips tightly closed, while they slowly fill the lungs by taking in the air through the nose and as slowly expel it through the same channel. Children who cannot do this after repeated trials without opening the lips will be found to have nasal obstruction and in need of treatment. Breathing, to be natural, should be with the diaphragm and the abdominal muscles. Raising of the shoulders while filling the lungs under forced inspiration should be

strictly prohibited, as this develops a faultly method of breathing, often seen in female singers upon the stage. Girls should be taught that a tight corset or other tight clothing about the waist prevents normal breathing and tends to produce disease.

Nature has provided the nose with a peculiar bony structure known as turbinates—bones rolled in a spiral form—to increase the surface of the air-passages over which the air must pass on its way to the lungs. The nasal pasages, including the turbinates, are covered with a peculiar ciliated mucous membrane, and studded with numerous little glands which constantly bathe this membrane with a thick, tenacious fluid, over which the air must pass on its way to the lungs. Situated just within the nostrils are also a great number of tiny hairs. These small hairs, the cilia—tiny projections—and the fluids are provided by nature for the purpose of purifying the air thus passing to the lungs of particles of dust and other irritating substances and many micro-organisms floating in the atmosphere. To rob the system of the benefits of free

breathing through normal passages is to invite disease, to handicap our children physically and mentally, and possibly to lay the foundation for premature death.

The introduction of the out-door school is a movement in the direction of improving the health of the children so handicapped and will doubtless do much towards lessening the number of contagious and infectious diseases; but operative procedures will still be necessary to relieve the obstructed nasal passages and to enlarge these passages by the expansion of the dental arches.

Good blood can only be made from good food properly masticated, digested, assimilated, and oxygenated. Proper mastication cannot be accomplished without *good teeth.* Normal digestion is impossible without *proper mastication.* Perfect assimilation is impossible without *normal digestion.* Normal oxygenation is impossible without *free, unobstructed, and healthy* air-passages and plenty of *pure air.*

CHAPTER VII.

ORAL HYGIENE AND THE SCHOOL CURRICULUM.

The principles of oral hygiene are so simple that any child of school age, with ordinary intelligence, can understand them. There is, therefore, no reason upon that ground why the teaching of oral hygiene may not become a part of the curriculum of our public schools. It would not be necessary to teach the child all the reasons why oral cleanliness is essential to a vigorous body and mind, but he or she can be taught how to keep the mouth clean, and some of the more patent and simple, social and cosmetic reasons therefor, reserving the more scientific reasons, such as belong to individual health, public health, increased mental capacity, longevity, and its influence upon posterity, to the higher schools. No school curriculum, however, should be considered complete that does not provide for the teaching of this department of sanitation. This necessity must be self-

evident, from the facts presented in the foregoing pages.

There is, however, much prejudice to be overcome, by those interested in this subject, upon the part of physicians, public-health boards, school boards, teachers, and parents themselves. This prejudice is in some instances due to a lack of knowledge or appreciation of the fact of the very close relationship which exists between an unhealthy and unclean mouth and many very serious general diseases of the body, such as tuberculosis, gastritis, gastro-enteritis, pneumonia, diphtheria, etc.; or of the very close relationship which exists between affections of the teeth and certain diseases of the eyes, the ears, the accessory sinuses of the mouth and nose, or of many reflex neuroses dependent upon dental diseases, or of the relationship which epilepsy and insanity sometimes bear to diseased teeth

In other instances this prejudice is the result of ultra-conservatism. "The old way is good enough." "Why should we take up every new fad that comes along?" "Our children are better cared for than we were, and yet they are no more robust

in body or brighter in mind than was our generation." These people forget the change in environment that has taken place since their school days. Then the population was widely scattered over large country districts, with their pure air, wholesome food, early hours, and simple pleasures largely enjoyed in the open air. Now the population is largely crowded into cities, with their fetid air, unwholesome food—food gathered green and ripened in transit—stale vegetables, cold-storage meats and eggs, impure, doctored milk, adulterated or poisonous preserved or canned fruits, vegetables, and meats: unwholesome drinks served at the soda fountains, the syrups made by *synthetic chemistry* instead of pure fruits and grape sugar: badly ventilated and over-heated houses, school-rooms, churches, and public halls; stuffy street-cars and railroad-coaches; their late hours and exciting pleasures. No wonder these children are no more robust and no brighter in mind than were the children of the generation that immediately preceded them. The wonder is that so many have survived under the handicap placed upon them.

Others will be prejudiced against it on account of the expense attached to its teaching and practice. This will be the objection most often raised by the school boards. With little effort it can be proved to the satisfaction of these gentlemen that oral hygiene taught and practised in the public schools will be a wise economic measure, as it improves the general health of the children, betters their conduct, increases their mental activity and capacity, lessens truancy, and greatly reduces the number of days lost from ill-health, as is shown by the reports of Dr. Ebersole and Miss O'Neill (which will be found in Part III, Chapter XV), while it greatly reduces the number of children who fail to pass their examinations and have to remain a second or a third year in the same grade. Illness imposes a heavy drain each year upon the funds of the school boards in our large cities, and has been for many years one of the serious problems discussed by them. The question of how to overcome it has never been answered until now. The work done at the Marion School of Cleveland, Ohio, has blazed the way for the

anxious school boards, and has demonstrated, to those who are interested in the subject of oral hygiene, that this department of sanitation will prove to be one of the greatest factors in the conservation of the public health; an equally important factor in correcting the ever-increasing delinquency list in our public schools; adding to the physical comfort and happiness of the children generally; improving their health; clearing their minds; making study a pleasure instead of a bore, and improving the general conduct of the school. Where health abides happiness abounds. *"The health of the people is the supreme law."*

THE TEACHING OF ORAL HYGIENE AS A DEPARTMENT OF SANITARY SCIENCE IN THE PUBLIC SCHOOLS.

In most of the public schools in the poorer districts of our large cities it is usually the duty of at least one teacher to inspect the children as they enter the school building to see if their hands and faces are clean and if the hair has been properly brushed or dressed. Children who are not clean are either sent home

or to the toilet room to clean up before they are admitted to the school-room. A few lessons of this character soon show their good effects upon these careless or neglected children and upon the homes from which they come.

A similar course might be pursued in relation to the teeth. The teacher could ask each child to show its teeth upon passing her, and if they were not clean, the child's attention should be called to the fact and informed that the teeth should be cleaned after every meal. If the parents are too poor to furnish a toothbrush for each of their children, then those who attend the school should be furnished with one at the public expense, and the child taught how to use it and care for it.

A better scheme would be to furnish every child in the school with a toothbrush properly tagged for identification. The tags should be of metal, and stamped with the number of the room to which the child belongs, his or her initials, and seat number if the children are seated in this manner. The brushes of each room should be kept by themselves in a special receptacle, preferably a large glass jar

with a ground-glass stopper. The brushes should be washed and sterilized by steam, or ethyl alcohol, after each use, and then immediately placed in their proper receptacle. By this plan there would be no danger from the transmission of disease from one mouth to another.

The objects of this plan are two-fold: First, it makes it possible to give the children a daily lesson in *how to clean their teeth,* and, second, it makes it possible to secure at least *one good cleansing of the teeth each school day.* In order to carry out this plan successfully a *tooth-brush drill* must be organized and practised every day. Ten or fifteen minutes devoted to this exercise each day would be of great value to these children. Accompanying the drill should be a few words of explanation from the teacher as to why the teeth and mouth should be kept clean,—its advantages to health, beauty, and mental activity, also to its commercial value as they arrive at an age when they are seeking employment. A boy or girl, looking for employment, who has a dirty, ill-kept mouth and teeth will have a hard time to find a situation, as

this condition shows slovenly habits and most business men are afraid to employ such people for fear these methods might be pursued in their business. A boy or girl with a bright face, a clean, wholesome mouth and teeth, and a pleasant smile, does not labor under such a handicap as this and, as a rule, readily finds employment.

The writer believes it would be a distinct advantage to public health if every grammar school could be supplied with a trained nurse who should be on duty during the school hours to look after the sanitary conditions; to advise with the principal and to take care of the children who complain of being ill, to render first aid in case of accidents, to assist the medical and dental school inspectors when making their periodical examinations; to have charge of the cleansing and sterilizing of the tooth-brushes, and of the tooth-brush drill.

PART II.

MOUTH SEPSIS.

CHAPTER VIII.

MOUTH SEPSIS.

Sepsis,—putrefaction; infection with pathogenic micro-organisms.

Septic,—putrid; a septic substance is a putrid substance; that which produces or results from putrefaction; rotten.

Sepsis, from the medical and surgical stand-point, is the effect or resultant of the decomposition of necrosed or dead animal tissue, either in molecular form or *en masse,* by a process induced by the action of certain non-pathogenic germs—non-disease-producing — or *saprophytic* germs, and the formation of ptomaines—animal poisons—and their absorption by the general system.

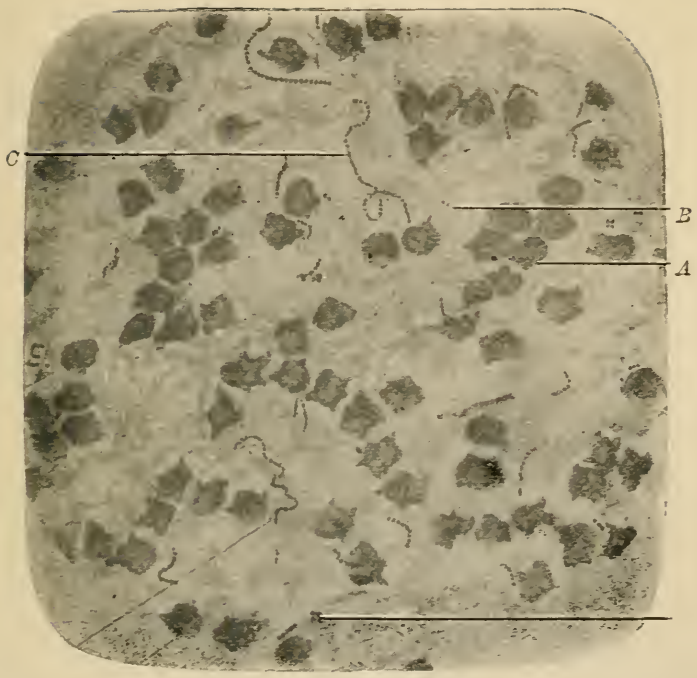
It also includes infection with pathogenic—disease-producing—germs, such as the *pyogenic*—pus-producing—micro-organisms, the *Koch* or cholera bacillus, the bacterium *typhosus*—the typhoid-fever germ—the *bacillus tuberculosis*—the germ of tuberculosis—and many others. The *saprophytic* germ can live and grow only

in dead and dying tissues, but may become the cause of disease by indirect measures—the formation of animal poisons and their absorption—producing what is known as septic poisoning. The *pyogenic*— pus-producing— micro-organisms (Figs. XVI and XVII) live and grow in living tissues, destroying the vitality of the cellular elements and converting them into pus-corpuscles. There are several varieties of these pyogenic organisms, some more virulent than others. The effect of infection with the pyogenic organisms will always vary with the virulence of the organism, the size of the dose,—or quantity introduced,—and the susceptibility of the tissues infected, in other words, to their resistance or the resistive power of the general system.

The human mouth in a diseased condition contains many of the most virulent septic micro-organisms, especially those associated with decayed teeth containing devitalized or gangrenous tooth-pulps,—acute and chronic dento-alveolar abscesses, gingivitis, stomatitis, and pyorrhœa alveolaris.

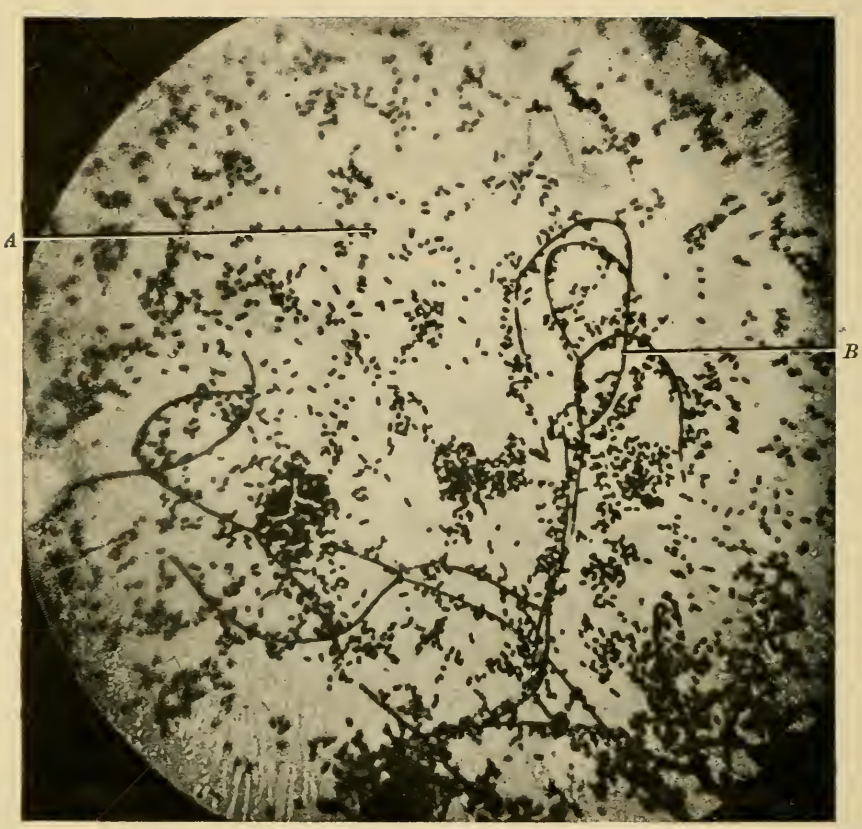
Dr. Hunter William is of the opinion

Fig. XVI.



Forms of Bacteria in Pus from an Abscess. ×700. *A*, Pus-cells; *B*, Micrococci and Diplococci; *C*, Streptococci; *D*, Tetracocci.

Fig. XVII.



Mouth Bacteria. (R. R Andrews.) *A*, Diplococci ; *B*, Leptothrix Buccalis.

that the most virulent of all the pyogenic organisms are those associated with necrosed bone and tooth structure.

Suppurative or septic conditions of the mouth are exceedingly common and are in a large majority of cases associated with the teeth. The statement has already been made, and the fact is recognized, that dental disorders are the most common of all diseases that afflict the human race and that many obscure diseases affecting the general system—such as chronic dyspepsia, gastritis, gastro-enteritis, certain nervous affections, tonsillar diseases, pharyngitis, bronchial and pulmonary affections, certain diseases of the eye and ear, and general septic conditions such as septicæmia and pyæmia—may be traced to infection from a septic oral cavity.

A septic oral cavity is generally, if not always, the result of neglectful habits, due usually to ignorance of the dangers to health and life that surround such conditions. Neglected dental plates, bridges, and crowns, faulty fillings, deposits of food débris, salivary calculus, dental decay, gangrenous dental pulps, acute and chronic dento-alveolar abscesses, pyorrhœa alveolaris, gingivitis and stomatitis in their

various forms, are all active factors in producing a septic mouth.

Dental surgeons have been trying for years to impress this fact upon their patients and upon the medical profession generally, but it has usually fallen upon indifferent or deaf ears. With a few remarkable exceptions, they have until quite recently made but few converts among medical men. These gentlemen have, as a rule, looked askance at any opinion upon a medical or surgical subject coming from a dental surgeon, believing that "The shoemaker should stick to his last." This attitude has doubtless retarded the just recognition of oral sepsis as an ever-present menace to individual and public health. The subject is one of vast importance from a public-health stand-point, not second to any other subject that concerns the physical and mental welfare of the people, for it strikes at the very foundations of the race in that 95 per cent. of all the public-school children are suffering from it, and as yet no adequate measures have been put in force to cure the evil or arrest its progress.

It is very evident that the profession,

and the public generally, are not awake to their responsibility in this matter, for if they were, the conditions would soon be changed. The introduction of vaccination against small-pox has almost driven the disease from the face of the civilized portions of the earth. Great efforts are being made to stamp out the scourge of tuberculosis. Much has been done to prevent cholera, diphtheria, tetanus, rabies, yellow fever, typhoid fever, cerebrospinal meningitis, etc., but practically nothing has been done to rescue the 95 per cent. of the school-children from the dangers of oral sepsis.

ORAL SEPSIS AND THE GENERAL HEALTH.

The writer first became interested in this subject in the summer of 1878 through a very interesting case referred to him by a lay friend. The conditions presented by the patient were so grave and the results of the treatment so satisfactory that it made a deep impression upon his mind.

The relationship existing between the oral conditions and the general health was not known,—only suspected,—but

upon the suspicion that there was an intimate relationship existing between them, treatment was undertaken, more, however, as a general cosmetic and sanitary matter than from any real expectation that the general health would be improved, but with the hope that a clean and healthy mouth might mitigate some of the more distressing local symptoms.

Case I.—*History.*—Miss S., American, public-school teacher, aged 40, reported, complaining of loss of appetite, a bad taste in the mouth, an excessive flow of saliva, causing frequent swallowing, pain in stomach after eating, with considerable flatulency, and a burning sensation in the stomach when empty, nausea in the morning but no vomiting. Every afternoon felt feverish, languid, and tired. Had frequent attacks of constipation and diarrhœa and accumulations of much gas in the intestines which caused discomfort and embarrassment. Had decreased considerably in weight, but could not say how much. Complexion pale and muddy. Pulse normal, with no evidences of fever. Mental condition not good; was melancholic and dejected; had lost interest in

her work, and did not expect to live very long.

Mouth in a very dirty, unsanitary condition. Teeth had not been brushed for many weeks, on account of causing bleeding of the gums. Food débris covered all the teeth. Thick coating of salivary calculus over the superior molars and upon the lingual surfaces of the lower incisors, cuspids, and bicuspids; rings of salivary calculus at the margins of the gums upon all the other teeth; gums swollen, red and ulcerated at the margins and festoons; pressure upon the gums caused bloody pus to well up around the lower anterior teeth and the superior molars. Mucous membrane of the mouth red and ininflamed. Had frequent attacks of tonsillitis. Teeth showed little evidences of dental decay. No teeth had been lost.

Treatment.—The treatment consisted in a thorough cleansing of the mouth and teeth and the removal of salivary calculus, painting the gums with the tincture of aconite and iodine, equal parts, after each treatment. The cleansing of the mouth and teeth occupied several sittings of an hour each, extending over a period

of three weeks, with semi-weekly visits for a period of three months, for treatment of the gums, the filling of a few cavities of decay, and to see that the patient was not neglecting her instructions as to mouth cleanliness. The results of oral cleanliness in this case appeared to the writer at the time as little short of marvellous, because so unexpected. Her physical condition began to show marked improvement at the end of the first month. The bad taste in the mouth had disappeared, the excessive flow of saliva ceased, the appetite returned, the morning nausea was much lessened, and the discharges about the teeth had abated.

From this time on, there was rapid improvement in all the other symptoms. The pain in the stomach after eating gradually lessened and finally disappeared, and with this the flatulency. The bowel symptoms, with the constipation, diarrhœa, and gas accumulations were the last of the general symptoms to disappear. From the first she began to lay on flesh, her color became healthful, her natural good spirits returned, and interest in her

work revived. In fact she was a well woman in less than three months after her mouth and teeth had been put in sanitary condition.

Case II.—During the following winter another very interesting case came into my hands through the courtesy of a medical friend.

History.—Mrs. R. S.,—Hebrew, aged 50 years, very pale and anæmic. Complained of loss of appetite, a very sore and sensitive mouth, tonsils and pharynx very red and inflamed, and had constant hacking cough; saliva thick and ropy; could not sleep when lying down; was exceedingly nervous, irritable in disposition, and greatly depressed. Had one tooth that had given great trouble—the upper left cuspid—face had frequently been swollen and pus discharged into the mouth. The physician had sent her to the writer for the extraction of this tooth. Examination of the mouth revealed the most astounding oral condition that had ever come under the notice of the writer up to that time. The troublesome tooth was the least grave of the conditions found to exist.

The patient had in her mouth a partial denture made on a silver base, that only partially covered the roof of the mouth, and containing eight teeth, to replace the superior right and left lateral incisors and the right and left first and second bicuspids and first molars, and held in position by clasps fitted to the cuspid and second molar teeth. Before attempting an examination preparatory to removing the tooth, the patient was requested to take out her plate. She said she could not, that it was put in by her New York dentist fifteen years ago, and that it had never been out of her mouth since; that it had *grown* (*?*) fast and that it was impossible to remove it. Examination of her mouth revealed the fact that it *was* impossible for her to remove the plate, for it was firmly cemented in position by accumulations of salivary calculus, which covered the teeth on each side from and including the third molars, forward to the first bicuspids attached to the silver plate. The mouth was in a very unclean state, the lower teeth in a filthy condition from the remains of food débris. The gums and the roof of the mouth were red and

swollen, and the plate embedded in the mucous membrane of the roof of the mouth. The plate was oxidized upon the exposed surface to a jet-black color. Pressure on the plate caused pain beneath it. Evidently the irritation from the embedded plate was very considerable.

The writer's experience with Case I led him to suggest to the patient that her ill health and nervous condition was due largely, if not altogether, to the diseased condition of her mouth, and that nothing could be done in the way of treatment until the plate was removed and the mouth and teeth thoroughly cleansed. Upon consultation with her physician, the case was placed in the writer's hands for such treatment as he might think best, as she had been under his care off and on for several years with only temporary benefit.

An appointment was made for the next day, when, after an hour of tedious and painstaking labor with chisels and excavators, the calculus was cut away and the plate removed.

The under surface—that in contact with the roof of the mouth—of the plate was not discolored, in fact it looked as if it

had just come out of the acid-bath, all other portions were jet black, showing oxidation. The soft tissue upon which the plate rested was covered with coarse granulations, which gave an acid reaction to litmus paper. There was considerable recession of the gums around all the teeth with which the plate was in contact, and all were more or less loose and discharging a greenish pus.

The mouth was then carefully washed with a solution of phenol sodique, one teaspoonful to a glass of water, and the troublesome tooth extracted; the patient dismissed with instructions to rinse the mouth with a similar weak solution of phenol sodique every two hours during the day and to return for further treatment in two days. At the next sitting she reported herself as much more comfortable; the mouth less sore and the saliva less ropy; did not cough so much last night. This was encouraging; so proceeded to remove the salivary deposits from the lower teeth. The roof of the mouth was still very tender and sensitive. Recommended liquid diet for a few days, or until the mouth had healed, and fre-

quent rinsing of the mouth and gargling of the throat with the phenol sodique solution. Instructed to report every second day.

At the third visit the surfaces of all the teeth were examined for unremoved deposits and carefully polished. The mouth conditions have greatly improved; roof of the mouth healing rapidly, ropy condition of the saliva is much less, cough greatly improved, tonsils and pharynx less inflamed, can lie down and sleep with little disturbance from the cough; has a little appetite. Recommended that she take soft food—soft-boiled eggs, milk toast, mashed vegetables, etc.

Fourth visit. Mouth has healed, and the taking of food is no longer painful; ropy condition of the saliva has entirely disappeared; seems to be normal; sleeps well; cough is much better; appetite good. Recommended full diet. Says she feels better than she has for months. Gave her specific instructions as to the care of the mouth, and further explained the necessity of great diligence upon her part to keep the mouth free from all foreign substances that could in any way cause ir-

ritation and inflammation of the tissues.

The case steadily improved day by day, and at the end of three months was discharged cured, greatly to her delight and that of her friends and her physician.

Many more or less similar cases from the early experience of the writer could be introduced to prove the unhealthy and dangerous effects of a septic mouth, but these are sufficient for the present purpose. The writer is free to admit, however, that at this period in his professional life, he was groping in the dark for some real, tangible, scientific explanation of how a dirty, unsanitary mouth could produce such grave general symptoms, and, although he was familiar with the " germ theory " of disease, it was not until the publication of Sir Joseph Lister's ideas of sepsis and antisepsis in relation to surgical wounds and diseases, that he began to appreciate the relationship that might exist between them. But a full realization of this relationship was not obtained until the publication of Prof. W. D. Miller's work on " The Micro-organisms of the Human Mouth and the Local and General Diseases which are Caused by

them." To this work of Prof. Miller the profession and the world owe much, very much, for he not only searched out and published to the world the local causes which produce decay of the teeth, but also proved that an unsanitary mouth is the habitat of numerous pathogenic bacteria which grow and multiply at a tremendous rate and are a source of constant infection and reinfection of other organs and tissues of the body, and constitute through their ever-constant presence one of the greatest dangers to the health of which sanitary and medical science has any knowledge.

In the light of our present knowledge in relation to sepsis and the spread of disease by infection, the etiology of the two cases just referred to is readily understood. In both cases the origin of the diseased condition was the unhygienic and unsanitary condition of the mouth and teeth: in the first, resulting in a septic gastro-enteritis; and in the latter, septic inflammation of the fauces, an irritative cough due to this inflammatory condition, and the thick ropy saliva and a general neurasthenic condition from the constant

irritation of the artificial denture and septic intoxication.

To Dr. William Hunter, of London Fever Hospital, belongs the credit of arousing the profession to a realizing sense of the great dangers to the individual and public health from oral sepsis by the publication (in the (London) *Practitioner* for December, 1900) of his researches and personal experiences upon this subject. In his introduction he says: "For the last twelve years, in connection with various studies, my attention has been called in increasing degree to an important and prevalent source of disease, one whose importance, I think, is not sufficiently recognized. The source is oral sepsis—sepsis arising in connection with diseased conditions of the mouth. My attention was first drawn to it in connection with the pathology of anæmia; and since then it has been extended in connection with the pathology of a great number of infective diseases which have one factor in common—namely, septic organisms underlying them.

" The case which brought to a head my interest in this subject was one I met with

some two years ago. It definitely proved the connection between oral sepsis and one of its commonest effects—one so marked and so common that I have designated it by a special name, *septic gastritis*. Since then I have seen a large number of cases, illustrating both the frequency and the importance of the subject; illustrating, moreover, what I regard as more striking—the extraordinary degree to which oral sepsis is overlooked, alike by all parties concerned—the physician, the surgeon, the patient.

"I have already had occasion to draw attention to the subject; but additional experience only serves more and more to emphasize its importance from medical, surgical, and preventive medicine points of view.

"I desire here to point out once more how common a cause of disease it is, how grave are its effects, how constantly it is overlooked, and what remarkable beneficial results can be gotten from its removal. In so doing it is not my purpose to select rare, isolated cases from the literature in order to produce a picture which may arrest attention from its dark colors.

I shall illustrate the subject by cases from my own experience, thereby bringing out how common the condition is." The interested reader is referred to this article.

During the last decade much interest has been manifested in this subject by certain members of the profession, and much interesting material has been added to the literature of the subject, particularly in relation to its prevalence and a more general recognition of its potency as a factor in spreading infectious diseases. And yet there are many, very many, professional people who do not realize the importance of controlling or eradicating from our midst the great evil of an unhygienic, unsanitary, septic mouth. The condition is so common, even among otherwise cleanly persons, that it is overlooked, or, through colossal ignorance of its dangers to the health of the individual and the public, thought to be not worth serious consideration. The interdiction by law of spitting in any street-cars, railroad coach, halls of public assembly, and upon the side-walks will do much to prevent the spread of infectious diseases. But this is a measure aimed primarily

at the prevention of the spread of tuberculosis, and did not at the time take into account the dangers of the dissemination of various diseases by the organisms found in a septic oral cavity; and yet some of the pathogenic organisms found in the mouth are nearly as virulent as is the tubercule bacillus.

The spread of such infectious diseases as diphtheria, tonsillitis, pharyngitis, influenza, bronchitis, pneumonia, and pulmonary tuberculosis among the children of the public schools is, without doubt, greatly augmented by the usual unsanitary condition of the mouths of a great majority of the children.

The fight that is being made against the spread of tuberculosis meets with many physical barriers that are difficult to overcome. Not so with oral sepsis; the only obstacles in the way of a complete revolution in this matter are indifference, prejudice, and ignorance.

CHAPTER IX.

DISEASES OF THE TEETH AND MOUTH CAUSED BY ORAL SEPSIS.

The toxic nature or poisonous property of human saliva is a well-known fact, the knowledge of which dates back to the earliest days of medicine.

Galen, Aristotle, Pliny, and other ancient writers speak of its poisonous effects upon animals. Aristotle mentions a girl whose bite was as poisonous as that of a venomous snake, and that animals wounded with arrows dipped in her saliva died from its effects. There is also a popular impression that the human saliva is most virulent or poisonous during anger or nervous excitement.

Pasteur (1881) discovered the poisonous nature of human saliva to depend upon a group of mouth micro-organisms, including the micrococcus of sputum septicæmia. Miller looks upon this organism as one of the most important of all the mouth bacteria, as it is very virulent and is the same organism that

produces lobar pneumonia—the pneumococcus—and doubtless the direct cause of this disease. Injections of cultures of this organism killed rabbits in from twenty-four to thirty-six hours. The bacteria of the human mouth are very numerous, as shown by the investigations of Miller, Black, Robin, Goadby, Vicentini, and other investigators. Considerably over a hundred different species have been discovered at various times and under varying conditions. About one-third of these are known to be pathogenic—disease-producing—germs, some of which have properties of great virulence, for instance, the micrococcus of sputum septicæmia just referred to and the bacillus pulpæ gangrenosæ—the organism found in a decomposing tooth-pulp—which is the most virulent of all and is the common cause of acute dento-alveolar abscess.

The pyogenic—pus-producing—organisms are found everywhere: in the air, in water, in the soil, in the dust of the streets; upon the surfaces of the human body, particularly in the epidermal covering of the skin, in the folds of the skin, at locations where the sweat glands are most numer-

ous—under the arm, etc.; in the hair, under the finger nails, in the nasal passages; but most abundantly in the mouth.

It is generally conceded that these organisms are found in every mouth, the abundance being governed largely by its hygienic and sanitary condition. The unsanitary mouth offers a most admirable field and soil in which they grow and multiply with great rapidity.

These organisms are really omnipresent, and ready at all times to take advantage of any opportunity offered to attack the tissues of the body and produce disease.

AVENUES OF INFECTION OF MOUTH BACTERIA.

Prof. Miller arranges these avenues of infection under six heads, according to the point of entrance:

"1st. Infections caused by a break in the continuity of the mucous membrane, brought about by mechanical injuries. These lead to either local or general disturbances.

"2d. Infections through the medium of gangrenous tooth-pulps, which lead to the

formation of abscesses at the point of infection, but may also lead to secondary septicæmia and pyæmia with fatal termination.

"3d. Disturbances conditioned by the resorption of poisonous waste products formed by bacteria.

"4th. Pulmonary diseases caused by inspiration of slime—mucus—small pieces of tartar, etc., containing bacteria.

"5th. Excessive fermentative processes, and other complaints of the digestive tract, caused by the continual swallowing of microbes and their poisonous products.

"6th. Infections of the intact soft tissues of the oral and pharyngeal cavities whose power of resistance has been impaired by debilitating diseases, mechanical irritations, etc.

"In this connection the possibility of an infection by the accumulation of the excitants of diphtheria, typhus, syphilis, etc., in the mouth must also be taken into consideration."

The most common avenue of infection by pyogenic bacteria within the mouth is through some break in the continuity of

the mucous membrane. It may be only a slight abrasion or a minute wound such as might be made by the bristles of a hard tooth-brush, a tooth-pick, a fish-bone, or a too vigorous use of the floss-silk, or a more serious lesion such as that made by the extraction of a troublesome tooth, either of which would furnish a sufficient entrance or point of attack, and might prove exceedingly dangerous in a particularly unclean mouth, by reason of a lowered vital resistance of the injured tissues or of the general system such as might follow a debilitating illness.

That the presence of pathogenic bacteria in the mouth does not always result in the production of disease is due in large measure to the remarkable resistive powers possessed by the mucosa of the mouth, to the power of the blood, through the phagocytes—white cells—to destroy the bacteria that may enter the system, and to the number that may gain an entrance or be introduced at any one time. This process may be looked upon as a desperate battle waged between two opposing armies; the phagocytes upon the one side, and the bacteria on the other,

being assured that the strongest and most numerous force will conquer. How important, then, is the conservation of the general health!

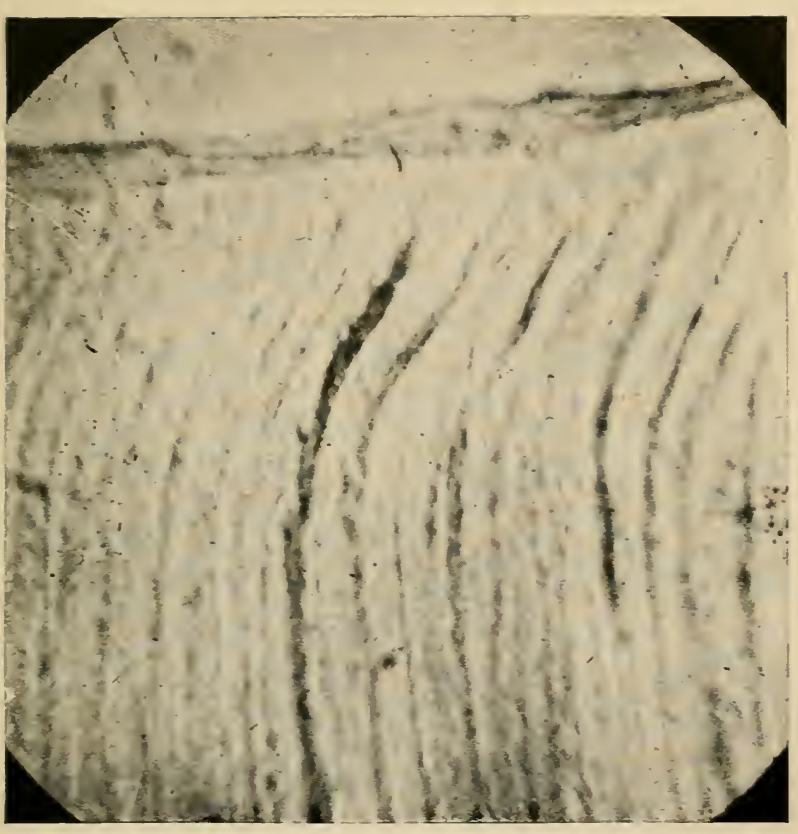
DISEASES OF THE TEETH.

The most common disease of the teeth, due to an unsanitary mouth, is that of *dental decay,* as already stated in a previous chapter, and is due to the dissolving action of acids upon the lime salts of the teeth. These acids are produced by the action of the zymogenic—fermentative—bacteria upon particles of food left in the mouth and lodged between the teeth or in the pits and grooves upon their surfaces. This action always begins upon the outer surface, or enamel, of the teeth, and as the enamel becomes softened it is removed by the friction of mastication and other means, leaving a shallow cavity, which then offers a larger and more suitable lodging-place for food and greater activity of the acid-producing germs. This process of decay usually extends towards the centre of the tooth, following the *dental tubuli*—microscopic tubes in the dentine. The acid-producing germs

penetrate the dental tubuli and rapidly multiply, and by dissolving the lime salts of the surrounding dentine, enlarge the tubuli (Fig. XVIII). Later these enlarged tubuli coalesce to form cavities which are filled with the germs (Fig. XIX). This process goes on until the dental pulp is reached. The acid formed by the fermentation of the food débris acts more rapidly upon the dentine than upon the enamel, and, as the process of decalcification—removing of the lime salts—goes on, the dental tubuli are left behind as the leathery or cartilaginous substance, which is later gradually dissolved or liquefied by the saprophytic—putrefactive—germs and washed away. The disagreeable odor and taste from a decaying tooth are caused by the putrefaction of this cartilaginous substance. This process of decay may become arrested through a changed environment, which constitutes immunity.

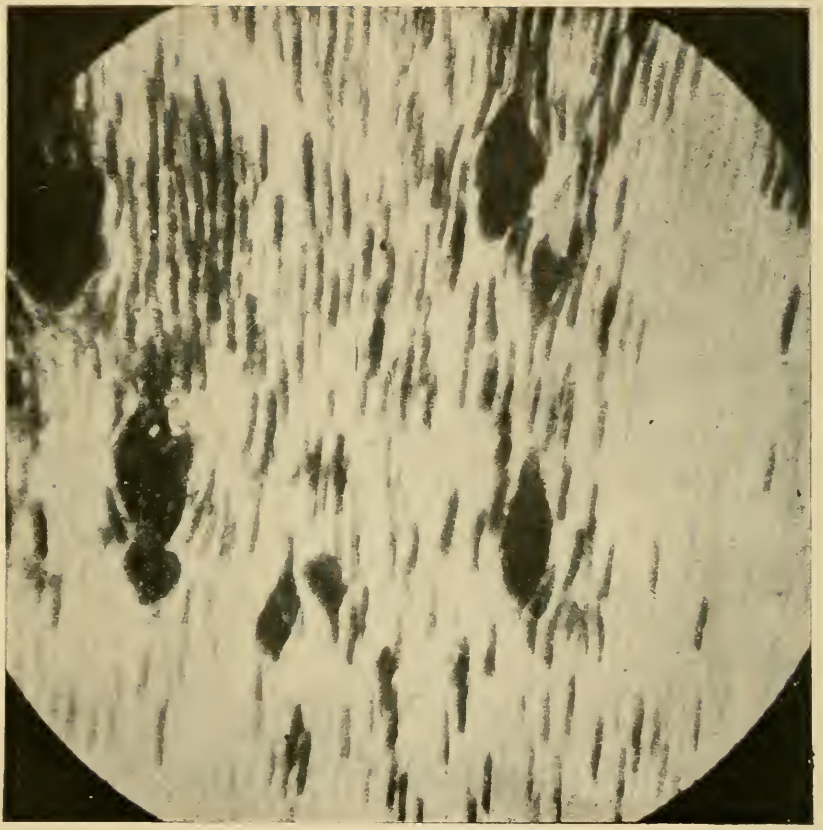
Just what constitutes this change in environment has not as yet been positively proved, but that it is related to the salivary secretions there seems little reason to doubt, as shown by an article recently published in the *American Journal of*

Fig. XVIII.



Infected Dentine, Showing Tubuli Greatly Enlarged and Filled with Micro-organisms.

Fig. XIX.



Infected Dentine, Showing Coalescence of Enlarged Tubuli forming Cavities and Filled with Micro-organisms. (R. R. Andrews.)

Physiology, upon the results of extensive research upon the Neutralizing power of the Saliva in its relation to Dental caries.[1]

PULPITIS.

One of the common results of dental decay is pulpitis—inflammation of the tooth-pulp—or tooth che produced by the pyogenic bacteria. This is an exceedingly painful affection, which sooner or later ends in death of the organ and remission of pain. Children frequently suffer from this form of dental disease when their teeth are neglected and allowed to decay.

Dento-alveolar Abscess — gum-boil — usually follows death of the pulp after an interval of from two to four weeks, by infection of the tissues at the apex of the root with the virulent *bacillus pulpæ gangrenosæ.* These organisms follow the canal in the root and set up most violent acute inflammation, and the formation of an abscess, accompanied by severe throbbing pain, great swelling, and elevation of temperature. This is a serious affection and should never be neglected, as it may result in necrosis of the jaw or acute sep-

[1] Marshall, John Albert, M.S.: The American Journal of Physiology, vol. xxxvi, No. 3, Feb., 1915, pp. 260–279.

ticæmia — blood-poisoning — and death. Many cases are on record of a fatal termination of this disease. The abscess if allowed to run its course will usually, except in the very serious cases, point upon the gum and rupture—break—discharging its contents into the mouth, when the more acute symptoms will subside, but leaving behind a chronic discharge which may last for years unless appropriate treatment is adopted. This latter condition constitutes one of the most prolific sources of oral sepsis.

Dento-alveolar abscesses associated with the upper jaw not infrequently rupture into the nasal fossa, simulating a chronic nasal catarrh, or into the maxillary sinus —a natural cavity in the upper jaw just above the bicuspid and molar teeth and beneath the eye—and cause what is known as empyema—a collection of fluid—generally pus from the abscess which has discharged into it. After a time gas is formed in the sinus from putrefaction of the pent-up fluid causing distention and pain with protrusion of the eyeball upon the affected side. The walls of the sinus become thinned and sooner or later rup-

ture. This usually occurs into the nose, as the bone at this point is least resistant. Occasionally it will rupture into the orbit and penetrate the skull, causing death by septic cerebral meningitis.

Dento-alveolar abscess associated with the lower jaw usually ruptures upon the gum within the mouth, but it is by no means uncommon for it to penetrate the soft tissues of the face and discharge upon the chin or lower border of the jaw. Not infrequently the abscess will penetrate the lingual alveolar plate and burrow into the soft tissues of the floor of the mouth and produce a septic cellulitis or Ludwig's angina. Occasionally, as in the case of impacted lower third molars, the pus will burrow beneath the jaw and follow the spaces between the muscles and rupture upon the neck or breast. The latter are very serious conditions and may terminate fatally through general septic poisoning. The common results of violent acute dento-alveolar abscess are periostitis, ostitis, osteo-myelitis, abscess of the accessory sinuses, and necrosis, or death of the bone. These conditions are productive of very grave results, as they furnish,

through the constant discharge of a very virulent pus, one of the most serious sources of auto-infection, both local and general, that are to be found in the oral cavity.

The absorption of ptomaines and the entrance of the micro-organisms into the blood and lymph channels from dento-alveolar abscess, periostitis, osteitis, osteomyelitis, and necrosis of bone are also productive of many serious affections in remote parts of the body dependent upon pyogenic infections and saprophytic or septic intoxication.

The soft tissues of a septic oral cavity are very prone to take on inflammatory action, particularly if the teeth are badly decayed and salivary deposits are present in considerable amount, as these conditions produce more or less mechanical irritation, abrasions, and slight wounds upon the mucous surfaces. Such wounds permit the entrance of the pyogenic bacteria and set up septic inflammation and ulceration. The gums are very liable to these forms of inflammation, through the mechanical irritation and abrasion of the tartar found upon the teeth and encroaching

upon the gums. The mucous coverings of the lips and cheeks are often injured by the same cause and by rough and jagged portions of decaying teeth, and also by infection of glandular structures from the presence of the pyogenic bacteria. The tongue is sometimes the seat of ulcers due to the mechanical irritation of decayed teeth and masses of tartar, and infection with the pyogenic bacteria, and which do not heal until these causes of irritation are removed. Ulcers of this character ing-points of *cancer*. The local manifestations of pyorrhœa alveolaris—namely, the suppurative conditions of the sockets of the teeth—are due to infection from the same pyogenic bacteria, and unless these conditions are successfully combated will lead sooner or later to loss of the teeth. Dr. Woods Hutchinson recently said in discussing the value of the teeth—good teeth—to the general health: " Man hangs onto life by his teeth. When we talk about losing our grip it is often our dental grip that we mean." " Their importance is only equaled by their prominence and accessibility. They are first in

peace, first in war and first in the mouths of our countrymen, and whenever we will we can do them good." "The next demand of the teeth is that they be kept clean, and for that purpose nothing has been invented to equal the modern tooth-brush." " The proof of the brushing is in the shiny teeth, and upon a basis of hundreds of thousands of cases, there is nothing that either the medical or dental professions feels so absolutely confident of getting desired results from as from plain bristles faithfully applied three times a day." "Brush without ceasing, thoroughly, gums as well as teeth, after every meal and at bedtime, and you can pretty certainly bank upon it that your teeth will stay by you until sixty, sixty-five or seventy. You will probably lose a few even with the best of care, but you will have plenty left to anchor to, your dental arches may be ' disfigured, but still in the ring,' until you yourself throw up the sponge."

CHAPTER X.

DISEASES OF THE THROAT, THE EAR, THE EYE, AND THE CERVICAL GLANDS CAUSED BY ORAL SEPSIS.

THROAT AFFECTIONS are always more prevalent during the winter or cold months and early spring than during the summer. The popular opinion as to the reason for this difference in the seasonal prevalence is that during the cold months and early spring people are more liable to *take cold* than they are in the summer months.

The correct explanation, in the writer's opinion, lies in the fact that during the summer time the people are less exposed to infections, because they spend more time out of doors, and that their homes, the school-rooms, churches, public halls of assembly, street-cars, and railroad coaches are all wide open and well ventilated, thus reducing the danger of infection to the minimum; while during the winter and the inclement months of the spring the people largely remain in-doors, and their homes, places of business, and

public resorts, including the school-rooms, the churches, street-cars, and railroad coaches, are heated to an unnecessary degree and badly ventilated. As a result the air in these buildings is foul and loaded with septic organisms from the mouths of people who pay no attention to oral cleanliness, or who are suffering from some infectious or septic oral, throat, bronchial, or pulmonary complaint, the germs of which find lodgement in the air-passages and the mouth of the assembled people and establish infections that would be practically impossible out of doors or in well-ventilated open buildings and public conveyances.

Periodic attacks of tonsillitis almost invariably accompany an unsanitary, septic oral cavity. This has been a matter of such convincing observation for several years, upon the part of the writer, that he feels like saying that tonsillitis is never associated with a clean, hygienic mouth, except from direct infection through unclean instruments of the oral or throat specialist.

Pharyngitis, laryngitis, and angina are septic inflammations having their

origin in a septic condition of the nasal or oral cavities, but most frequently from an unclean septic mouth, and which can be prevented in a large majority of instances by a proper attention to oral cleanliness and oral hygiene.

Very much has been written during the last decade upon the subject of the *"Tonsils as Portals of Infection,"* but the question as to what extent these glands are responsible for the introduction of infectious materials into the lymph and blood streams is by no means settled. There is no doubt that under certain conditions they may become active factors in the absorption of toxic materials, as in diphtheria and scarlet fever, but no more so than the mucous membrane and lymphoid tissues of the pharynx, naso-pharynx, and fauces.

Some authors lay so much stress upon the rôle played by the tonsils as gatherers and disseminators of infectious and toxic materials that they entirely overlook the possibility and the probability that much of the general infection for which the tonsils are blamed is due to the absorption of pyogenic organisms and toxins by the

mucous membrane and lymphoid tissues of other portions of the throat and of the mouth. The tissues of a septic mouth are always in a more or less inflamed condition, and many times in a state of suppuration and ulceration; these conditions being particularly favorable for the production of toxins and for the absorption of septic materials.

With a very few exceptions no mention is made in these articles of the unsanitary mouth and the rôle it plays in the production of septic materials and as a *portal of infection.* The septic mouth is the incubator from which the tonsils most likely receive their infection with pyogenic micro-organisms and certain toxins elaborated by the saprophytic germs.

Packard [1] is a notable exception in this regard, as he calls especial attention to the multitude of pathogenic micro-organisms found in the human mouth, and suggests, " With such an array of micro-organisms in the mouth, it seems as though there must be constant infection of the mucous membrane."

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[1] New York Medical Journal, June 24, 1899.

Mayer [2] in this connection says, "The strictest attention to the hygiene of the mouth should be enjoined even after thorough ablation of the tonsils," thus recognizing the possibility of infections occurring through other tissues than the tonsils.

The spreading of diphtheria is much more rapid and its virulence greater among children with neglected and septic mouths than among those whose mouths are in a fairly hygienic condition. The presence of the bacillus of diphtheria in the human mouth was first observed by Löffler in the mouth of a healthy child. These organisms have since been frequently found in the mouths of healthy persons and seem under such circumstances to do no harm. Miller [3] thinks that this fact "favors the view that the secretions of the mouth are a suitable nutrient medium for the germs of diphtheria, and that possibly they appear in the mouth oftener than has heretofore been supposed, reserving their specific

[2] Journal American Medical Association, December, 1899.

[3] Miller's Micro-organisms of the Human Mouth, p. 337.

action until certain favorable conditions prevail."

The Massachusetts Associated Boards of Health [4] found in some recent investigations that the Klebs-Löffler bacillus was present in the throats of from one to two per cent. of all healthy persons, and in from eight to fifty per cent. of all those who had been exposed to diphtheria in families.

How very important, then, becomes the care of the human mouth and the preservation of its tissues and secretions in a healthy state! *Cleanliness,* first, last, and all the time, should be the watchword, not only in the nursery of the well-to-do and the rich, but in every home in which children abide, particularly in the homes provided for the indigent children of our great cities and commonwealths, for in these places neglect of oral cleanliness is most likely to be found.

Albert Mills [5] found that "the microorganisms in the saliva in general increased the virulence of imported germs." The fact that the virulence of the bacillus

[4] Medical Record, March 2, 1907.
[5] Ann. Roy. Soc. de Med. et Nat. de Brux., 1896.

of diphtheria can be exalted by inoculation along with it of the streptococcus pyogenes—a pus organism—is very pregnant with suggestion (Alderson).

In this connection it may be proper to ask if the bacillus of diphtheria, of tuberculosis, of cholera, and of syphilis, when transplanted to a septic mouth, may not have their virulence greatly increased by growth in such an environment?

Pommay[6] says, "Virulence is not a primitive original, and necessary condition of pathogenic microbes; it is an acquired, contingent condition, which proceeds from the evolution of certain microbes in certain conditions and soils. Of culture media some increase or create the virulence; others attenuate or extinguish it; others are indifferent—that is, neither modify nor produce it."

Ellegood[7] is of the opinion that "The life processes of some of the bacteria always found in the mouth appear at times harmless, and at others malignant, in the sense of being inimical to the healthy conditions of the tissues. The vital

[6] Vicentini's Bacteria of the Sputum, etc., p. 153.
[7] Laryngology, 1906, p. 270.

phenomena of some of this class, however, as well as of numerous species whose occurrence in the mouth is purely accidental, are under certain circumstances distinctly pathogenic."

Dr. Ackerly,[8] of London, says, "I am convinced, after holding a post as medical officer to an isolation hospital for many years, that the severity of throat symptoms in diphtheria and scarlet fever, and of the severity of an attack of enteric fever, depends largely upon the presence or absence of oral sepsis; and in such a disease as appendicitis there is much reason to believe that oral sepsis has much to do with the more severe cases in which a catarrhal affection rapidly becomes a purulent inflammation. The extraordinarily rapid improvement which takes place in the dyspepsias and other troubles of the people when there is only slight sepsis when this is attended to, by itself justifies such attention and makes delay blameworthy."

He says, further,[9] "When patients admitted with diphtheria had clean mouths

[8] British Journal Dental Science, July, 1910, p. 586.
[9] British Journal Dental Science, July, 1910, p. 599.

and good teeth, the pathologist reported that cultivations from the throat showed a pure or almost pure culture of the diphtheria bacillus; but when the mouth was dirty, the culture showed a mixed infection and the type of disease was severe. In cases of typhoid, too, it made an enormous difference whether the mouth was clean or dirty, on the course of the disease."

Rosenow,[10] the noted bacteriologist of Chicago, has found that by changing the environment of a specific micro-organism, its specific action may be changed. By varying the degrees of oxygen tension alone, upon members of the streptococcus group, changes in virulence occur, and they acquire different affinities for various structures.

Diseases of the ear of septic origin are frequently associated with an unclean and septic oral cavity, particularly those conditions which are dependent upon the staphylococci, streptococci, and the pneumococci as sources of infection. The nasal passages are almost never free from these organisms, and it is quite probable

[10] Journal American Medical Association, vol. 63, p. 2027.

that many middle-ear affections are due to the presence of these organisms located primarily in these passages. The oral cavity is, however, never free from septic organisms, and when it is in a neglected, unsanitary condition, it is a veritable hotbed of infection, swarming with myriads of septic organisms which infect the tonsils, the pharynx, the nasopharynx, the larynx, the trachea, the bronchial tubes, the lungs, the stomach, and the intestines.

The micro-organisms of a septic oral cavity travel from the mouth to the tonsils and pharynx, from the pharynx to the nasopharynx, from the nasopharynx to the Eustachian tubes, and thus reach the middle ear. It is possible also for the pyogenic organisms in the mouth to reach the tissues of the middle ear through the blood and lymph streams.

In this connection the history of the following case will be of interest: Mrs. G., the mother of a medical friend, had for sixteen years been troubled with an offensive discharge from the left nostril. Prior to this she had suffered intensely from pain and swelling in the region of the left maxillary sinus, which lasted for

several weeks and then subsided. This condition was accompanied by a profuse discharge of offensive secretions from the left nostril. Later the swelling disappeared, but the discharge never wholly ceased. Six years after the first attack, the face again became very painful and much swollen, this time extending farther back, finally developing what was thought to be abscess of the middle ear. Large quantities of pus were discharged from the ear through the external meatus, and at one time it was feared that the suppurative process would extend to the meninges of the brain. After several weeks of intense suffering the symptoms subsided and finally the discharge from the ear entirely ceased. After this, however, the discharge from the left nostril seemed to be increased and the symptoms were always aggravated by taking cold. The teeth upon the left side of the upper jaw had all been extracted one by one as a possible cause of the trouble, except the third molar, which had never erupted. This procedure, however, produced no abatement of the symptoms. Later the teeth of the opposite side were removed

for the purpose of inserting a complete upper artificial denture. About ten years after the last-mentioned attack, while leaning over a wash-bowl, brushing her teeth, she suddenly noticed that the left nostril was plugged up by some movable body. On throwing the head backward in an attempt to dislodge it, the mass fell into the fauces, and was ejected from the mouth into the bowl. Upon examination, it proved to be a well-developed left superior third molar, more or less covered with hard concretions of a dark-brown color. The discharge from the nose from this time on grew gradually less, and finally, after a few months, ceased altogether.

The probable explanation of the peculiar features of this case are, briefly: first, the third molar was developed in an inverted position, and very near to the floor of the maxillary sinus. Second, suppurative inflammation was established in the crypt of the tooth germ from irritation induced by its development in an abnormal position and the lodgement and multiplication of pyogenic organisms floating in the blood or lymph streams. Third, the pus cavity ruptured into the

maxillary sinus. Fourth, the abscess of the middle ear may have been an extension of the tooth abscess, though there is some doubt as to this, as the anatomy of the parts does not readily favor such a supposition. The more probable explanation of the otitis media is that of infection through the blood and lymph streams. The tooth probably became lodged against the nasal wall of the sinus, causing ulceration and destruction of bone, which finally permitted it to pass into the nasal cavity, and thus be expelled.

Inflation of the Eustachian tubes in the presence of a septic oral cavity with almost certain infection of the nasopharynx by extension, is a dangerous procedure, and should never be undertaken until the dangers of a virulent infection have been removed by proper treatment of the septic condition of the mouth.

Pain in the ears is a frequent accompaniment of dental diseases, particularly of acute pulpitis, pericemental irritation, difficult eruption of individual teeth, and impaction of the third molars. Little children frequently suffer during dentition from reflex pain in the ears—

otalgia—due to pressure upon the gingival nerves during the eruption of the teeth, particularly the molars.

In adults the otalgia is most frequently associated with an acute pulpitis or an acute pericementitis. These conditions present no difficulties in diagnosis to the dental surgeon or the otologist, and appropriate dental treatment gives immediate relief; but the more rare condition of aural pain dependent upon the irritation of an impacted third molar often presents most perplexing symptoms. The most critical examination of the ear may give absolutely negative results, while a most thorough examination of the mouth and teeth may give no enlightenment upon the cause, except perhaps the absence of a third molar upon the affected side. Under such circumstances the Roentgen ray will decide the question of the presence or absence of the missing tooth and its position if present. Many times, however, the presence of the tooth is easily demonstrated by the aid of a fine steel probe, as usually a small opening can be found in the gum close to the posterior surface of the second molar,

that leads to the crown of the troublesome tooth. Cases of this character call for operation at the hands of an expert oral surgeon. The removal of the tooth usually cures the otalgia.

Diseases of the eye associated with septic conditions of the oral cavity may arise in three ways: First, by direct extension of disease, as in a case of purulent empyema of the maxillary sinus rupturing into the orbit, or by cellulitis of the cheek, or an osteomyelitis of the upper jaw, caused by dento-alveolar abscess, or by the migration of septic organisms from the mouth through the nasal passages and into the lachrymal canal and then into the conjunctival sac. Second, by the passage of septic organisms into the blood and lymph streams and the establishment in the optic tissues of metastatic foci of infection. Third, by reflex irritation through the fifth nerve, due to dental caries, hyperæmia of the pulp, interstitial calcification of the pulp—pulp stones—acute and chronic pulpitis, acute and chronic pericementitis, pressure upon the gingival nerves in tooth eruption, impacted third molars, crowding of the teeth,

as in cases of irregularities, where the jaw is too small for the teeth, and in the too rapid movement of the teeth by orthodontia appliances.

Cases of suppurative inflammation involving the orbit and the tissues of the eye, by extension from diseased teeth, such as cellulitis of the cheek, purulent empyema of the maxillary sinus, and osteomyelitis of the upper maxilla, are exceedingly dangerous, as they may cause loss of the eye, or the infection may extend to the cranial cavity and cause death by septic inflammation of the meninges of the brain. Fortunately, diseases of this character are not at all frequent.

Diseases due to reflex irritation are much more common and numerous, but it is sometimes very difficult to establish a positive diagnosis. Many times this can be done only by a process of exclusion. This arises in some instances from the uncertainty as to the point at which the reflex pain may be expressed. It has been learned from observation that in hip-joint disease the pain is usually expressed at the inner side of the knee, that in iritis the pain is usually located in the eyebrow,

while in cancer of the larynx it is expressed in the ear. A dental pulpitis may cause pain in the ear or the side of the face, or in the parotid gland, or in the eye, causing a profuse lachrymation. On the other hand, diseases of the eye have been known to cause reflex pain in the teeth.[11]

Among the diseases of the eye which have been traced to dental irritation are iritis, conjunctivitis, kerato-scleritis, optic neuritis, herpetic eruption upon the cornea, strabismus, amblyopia, glaucoma, amaurosis, ptosis, paralysis of accommodation, spasms of the muscles of the lids, and paresis.

An interesting case of amaurosis dependent upon dental irritation was published in the *Journal of the American Medical Association,* volume i, page 637.

History.—The patient, Mrs. L., 34 years of age, in fairly good health, was seized with severe pain in the left eye and great soreness in the left superior bicuspid tooth which had been filled about two years before. She had suffered for some little time a serious difficulty with the left eye, involving partial loss of sight, profuse lachrymal discharge, and severe par-

[11] Galezomsky, Journal d'ophth, 1872.

oxysmal pain. She stated that for several weeks after the tooth was plugged there was slight uneasiness in the tooth, with sensitiveness upon sudden changes of temperature, such as were produced by taking hot or cold drinks into the mouth, but nothing so marked as to require, in her judgment, any attention, and these symptoms finally passed away. In about six months after the operation upon the tooth she begun to experience pain in the left eye, of intermittent character, increased flow of tears, and some slight obstruction of sight. Consulted an eminent specialist in New York, who, after careful examination of the eye, could find no local cause for the difficulty and prescribed constitutional treatment. There being no improvement after several weeks, consulted him again, with the same results. On returning to Chicago, she consulted a leading ophthalmologist, who could find no local cause for the difficulty and thought it must be systemic. The symptoms had for months gradually grown worse, so that she had been obliged to give up reading and writing, as all such efforts aggravated the symptoms. In

this condition she again visited the New York opthalmologist. After a third careful and most painstaking examination, he said he could find no sufficient local cause for the symptoms complained of, and that he could do nothing for her except what might be hoped for through constitutional treatment. The history of the case being so remarkable, her dentist decided to ascertain the condition of the pulp of the tooth referred to. On excavating the cavity he found the bulbous portion of the pulp cavity filled with secondary dentine quite up to a line corresponding to the line of the alveolus. Above this the pulp was in a state of low inflammation. As the instrument pierced the pulp, the sensation was communicated to the eye, causing a paroxysm of pain. The previous removal of the filling had given some relief from pain in the eye and the soreness of the tooth had been considerably relieved. After removing the pulp, which he did at once, and treating the tooth for a few days, the pulp canal and the cavity of decay were filled. The case began to improve at once, and in a few weeks the sight was restored to

its normal condition and all the other symptoms had passed away.

The periodical literature upon diseases of the eye due to dental irritation of various forms is quite voluminous, particularly upon irritation from dental caries, pulpitis both acute and chronic, and septic conditions of the pulp canals and roots of the teeth.

Infection of the Cervical Glands.—Inflammation and enlargement of the cervical glands is a frequent accompaniment of a septic oral cavity, especially with suppurative conditions of the teeth, like dento-alveolar abscess and pyorrhœa alveolaris, and of suppurative and ulcerative conditions of the gums and oral mucous membrane, as in gingivitis and stomatitis. The mouth is a veritable incubator for the growth of septic organisms which sooner or later find their way into the submaxillary and cervical glands through the lymph channels and set up inflammation, thus preparing the way for that arch-enemy of mankind, the tubercule bacillus. This enemy is always arrayed at the portals of the citadel, armed and equipped and ever watchful to take

advantage of any mistake in strategy or weakness in the defence. The almost constant presence of the bacillus tuberculosis in the mouth renders it certain that much of the glandular involvement of this region comes from or through an infection from the mouth.

Neglect of the mouth and teeth of children is one of the chief causes of septic and tubercular abscess of the cervical lymphatic glands, and prepares the way for a general invasion of the tubercle bacillus and the establishment of tubercular bone diseases, pulmonary tuberculosis, etc.

Tuberculosis enters the system by three avenues:

1st. By the lungs, through direct inhalation of the specific organism in dried sputum.

2d. By the lymphatic glands of the intestines, through the presence of the organisms in foods and drinks.

3d. By the lymphatic tissue of the mouth and throat, through the constant presence of these organisms in the mouth. (Sims Woodhead.)

The most common causes of the enlargement of the submaxillary and cervi-

cal glands are infections from devitalized teeth containing gangrenous and putrefying pulps, chronic dento-alveolar abscesses, chronic suppurative gingivitis, ulcerative stomatitis, and pyorrhœa alveolaris. Chronic affections are much more liable to produce glandular enlargements and suppurative inflammations than are acute affections, like acute dento-alveolar abscess, acute gingivitis, or an acute stomatitis. Many, very many, cases of glandular enlargement located in the submaxillary and cervical regions have been referred to the writer for diagnosis and treatment, and in almost every instance a suppurating lesion has been found in the mouth,—most often a diseased tooth, the treatment of which from the aseptic stand-point or its extraction has been sufficient to cure the glandular enlargement. In a very few instances the mouth has shown no evidences of a suppurative lesion. In these cases inquiry has sometimes elicited the fact of a recent attack of tonsillitis which explained the glandular enlargement.

Many delicate children, who are poorly nourished, with perverted appetites, pale

and pasty complexions, peevish and fretful in disposition, dull in mind, acutely susceptible to changes in temperature and humidity, and with enlarged submaxillary or cervical glands, are sufferers from chronic toxæmia due to an unsanitary and septic mouth. The placing of the mouth of such a child in a hygienic condition will in a few weeks produce a marvellous change in body and mind, and will convince the most skeptical of the value of a clean and healthy mouth as a factor in the general health of the body and mind. Did the size of this little volume permit, numerous instances from the practice of the writer might be cited in proof of this statement. Cases of this character are so numerous that there should be no trouble in verification.

CHAPTER XI.

DISEASES OF THE STOMACH, INTESTINES, AND OTHER VISCERA CAUSED BY ORAL SEPSIS.

Diseases of the stomach and intestines associated with faults in digestion are usually attributed to catarrhal affections, induced by indiscretions in eating and drinking, overwork, worry, sedentary habits, lack of exercise, mental shock, general ill health, improper mastication or insufficient mastication due to painful teeth, decayed teeth, or loss of teeth. In view of our knowledge, however, of the enormous number of micro-organisms growing in a septic oral cavity, and of the fact that a considerable proportion of them are pathogenic in character and sometimes of great virulence, *sepsis* as a cause must be added to the above list.

The long-continued ingestion of myriads of septic and fermentative bacteria, during the preparation of the food by mastication and insalivation for the process of digestion, and during the intervals

between the taking of food, cannot but prove detrimental and positively harmful to the process of digestion and to the integrity of the gastric and intestinal mucous membrane and their glandular structures. We wonder sometimes why glandular infections of these tissues are not more common and why the results of these infections are not more disastrous to the health and general welfare of the human body than they are. This is partially explained by the fact that the human saliva has under certain circumstances an inhibitive effect upon the growth and virulence of these organisms; and that under other circumstances they accelerate their growth and increase their virulence. Furthermore there are periods in the life of the individual when the susceptibility to diseases is of greater or less degree than at other times, or there may be complete immunity established.

It is true also that the free hydrochloric acid of the gastric juice will destroy the vitality of many of the germs entering the stomach and thus protect itself against their irritating and septic effects. There are certain organisms, however,—such as

the tubercule bacillus, that is enclosed in a protecting envelope or capsule,—that may pass through the stomach and intestines entirely unharmed.

Ordinarily the growth of the putrefactive and zymogenic—fermentative—organisms is inhibited in the gastric juice, but when this fluid is weak in hydrochloric acid (HCl) or when the number of the ingested germs is so great as to overwhelm the corrective action of the acid, putrefaction and fermentation are set up in the stomach, causing irritation and inflammation of its glandular structures and the establishment of a condition of gastric catarrh, chronic indigestion, or dyspepsia.

If, on the other hand, the mouth is the seat of suppurative conditions such as in certain forms of gingivitis and stomatitis, or suppuration associated with dento-alveolar abscess and pyorrhœa alveolaris, or with extensive dental decay and gangrenous and sloughing dental pulps, which, as already stated, furnish the most virulent septic organisms, septic inflammation of the glandular structures of the stomach may be established—the septic gastritis of Hunter—by infection. These septic conditions not infrequently pass on to the

intestines, attacking the glandular structures and setting up an enteritis, or appendicitis, or colitis. The infection may also extend to the bile and pancreatic ducts, setting up a cholecystitis or a pancreocystitis. (Probyn.) It is not at all improbable that many cases of gastric and intestinal ulcer might be traced to infection of the glands of the stomach and intestines from the virulent pus organisms of a septic mouth.

Furthermore, the bronchial tubes and the lungs are subject to septic infection from an unsanitary mouth. Septic pneumonia is by no means an uncommon sequela of the administration of the general anæsthetics through entrance of particles of septic material and micro-organisms to the pulmonary structures during the stertorous breathing of narcosis. Miller [1] is of the opinion, as also Fränkel, Weichselbaum, and Baumgarten, that lobar pneumonia is in all probability an infection from the mouth due to the coccus of sputum septicæmia—pneumococcus.

Miller quotes Isreal [2] as furnishing

[1] Micro-organisms of the Human Mouth, pp. 261, 262.
[2] Micro-organisms of the Human Mouth, p. 299.

striking proof of the correctness of the supposition that pulmonary diseases may occur from the inspiration of pathogenic germs of the mouth. In a case of primary actinomycotic infection of the lungs, Isreal found a small irregular body resembling a piece of dentine, which he sent Miller for examination. It was found to consist of a fragment of dentine—tooth bone—surrounded by a chalky mass, composed of phosphate and carbonate of lime, presumably tartar—salivary calculus. The microscope revealed numerous threads of the ray fungus—the organism which produces lumpy jaw in cattle—and there can be little doubt that the fragment of dentine was the carrier of the infection.

Baumgarten [3] reports a similar case of primary actinomycosis of the lung, with secondary extension to the soft tissues of the thoracic wall, by the inspiration of the specific fungal elements growing in the lacunæ of the left tonsil.

Septic inflammation of the tonsils, of the pharynx, of the uvula, and of the larynx are all usually due to a direct in-

[3] Micro-organisms of the Human Mouth, p. 299.

fection from the pyogenic organisms found in the mouth, as are also gingivitis, stomatitis, and the local inflammatory manifestations of pyorrhœa alveolaris.

The diseases which may arise by indirect infection through the absorption of the septic mouth organisms and their entrance into the blood and lymph channels are exceedingly numerous; in fact, this possibility covers the entire range of all the pyogenic diseases, the more serious of which are osteomyelitis, ulcerative endocarditis, septic nephritis, septic empyema, septic meningitis, acute septicæmia, pyæmia, erysipelas, metastatic abscesses, diabetes, neuritis, tri-facial neuralgia, etc.

Dr. R. Ackerly, of London, in a recent lecture before the Royal Society of Medicine upon "Observations on the Condition of the Mouth in 1000 Consecutive Cases of Chronic Diseases,"[4] says: The real object of the lecture was to show the conditions of the teeth and oral cavity which prevail in those patients who are suffering from chronic diseases; how the teeth were used; and the effects of improper mastication. He says: "Before

[4] British Journal Dental Science, July, 1910, pp. 570–590.

giving an analysis of the cases, I wish to say that over 90 per cent. were really well-to-do people. Not 2 per cent. of them suggested that want of means prevented them having their teeth put right, and the vast majority of them were going to a doctor or a dentist more or less regularly."

In the table of the results presented he says: "I have adopted certain headings. *Excellent* means a mouth containing all the teeth in a good state of preservation, with or without all the wisdom teeth, with no gaps, and with only few stoppings. *Very good* would mean teeth with practically all grinding surfaces intact, even though many have been stopped. *Good* is applied to a mouth with the loss of not more than three molars altogether, *i. e.,* of not more than about 25 per cent. to 30 per cent., or teeth where the gaps, if large, are filled by satisfactory artificial teeth. *Fairly good,* if the grinding surface is not diminished by more than 50 per cent. With less than this I call them *defective.*

"In the 1000 cases observed, 9 cases, or 0.9 per cent., are described as

'excellent'; 22 cases, or 2.2 per cent., are described as 'very good'; 198 cases, or 19.8 per cent., as 'good'; 74 cases, or 7.4 per cent., as 'fairly good.' That is, 303, or 30.3 per cent., are either really good or fairly satisfactory, and provide, taking not too high a standard, teeth sufficiently good for mastication.

"The 'defective' mouths numbered 360, 36 per cent.; septic,—*i. e.,* obviously septic without the minute examination given in a dentist's chair,—227, or 22.7 per cent., with 0.8 in addition marked septic with a query. Of these 185, or 18.5 per cent., were both septic and defective; the rest—*i. e.,* 42—had septic gums with rotten stumps covered by plates. In many of the septic cases there were smaller plates, but, as explained, I recorded plates only when they supply 50 per cent. of the teeth.

"As regards plates 87, or 8.7 per cent., are described as good; 250, as plates only; and 20 are recorded as being definitely bad as plates, and are classed also as defective."

This, he thinks, "is rather a serious state of affairs considering the class of

patients." Had a hospital or less well-to-do class formed the basis of the investigation, he "had abundant evidence that the septic and defective sections would be enormously increased." "Is it not a reproach," he asks, "to us as a profession that more than one in three people in contact with medical men and dentists, and often in contact with men of some note, should be so badly equipped for so necessary a function as mastication? But that more than one in five should possess a *foul mouth* is still worse. And what makes it worse is that this condition is deliberately allowed by doctor and dentist."

"If careful mastication is necessary for those whom we choose to call healthy, because they are in the vigor of youth or have no marked pathological symptoms, surely it is much more obviously necessary for those who are failing in health and whose nutrition is imperfect, especially in the large groups of chronic diseases in which there are marked dyspeptic symptoms or faulty metabolism. This includes all the diseases of stomach, bowels, liver, pancreas, and directly or indirectly most

cardiac complaints; the conditions described as gouty and rheumatic; and all those in which there is obesity or wasting, or tendency to waste. Quite apart from the definite evils following the swallowing of lumps of food, or imperfectly salivated food, is it not obvious in these cases that it is only by attention to mastication, whatever else we do, that we can hope to improve the impaired nutrition? A great deal of attention has been bestowed to the dietary of sufferers from chronic complaints, and it is quite common for patients to be supplied with a list of articles of food that they must, or must not, eat; but very rarely indeed do I find that they are told, as I find it is often necessary to tell them, 'It is far less important what you eat than how you eat it.'" This is the great principle which underlies the teaching of Mr. Fletcher.

Dr. Ackerly further says: "We may take it as agreed that thorough mastication is important. That being the case, one would expect that the medical advisers of the people would as far as possible insist upon attention to the condition of the teeth, the removal of defective teeth,

especially if septic, and the correction of any mechanical impediment to mastication. These are the cases usually found at the hospital. Many of them are cases of very considerable duration, having been under treatment for many years, often by several doctors, and, on the whole, the patients are genuinely anxious to obtain and follow advice which is given to them with any show of reason fortified by conviction. They are suffering from various forms of dyspepsia, affections of the stomach and bowels, rheumatism, gout, so-called rheumatoid arthritis, arteriosclerosis, neurasthenia, and the majority of them are past middle life."

Dr. Brandon reports the following case: [5] "Mrs. S. J. W., aged 34 years. Had always enjoyed the best of health previous to her present trouble; was suffering almost continually with neuralgia (facial), also dyspepsia, and, as she termed it, sick-headache, nervous prostration, loss of sleep, irregularity of the bowels, etc., etc., so bad that she was compelled to keep her bed for days at a time. She had employed many physicians with only temporary benefit. Upon ex-

[5] Medical Record, 1883, p. 587.

amination, could detect no constitutional disturbance that could be attributed as the cause of her trouble. But noticing her foul breath, requested to examine her teeth, which were found in bad condition, several rotted down, others with the gums falling away, and so on. Requested her to have the offending members removed. She objected, as it would hurt, and went to another physician for treatment, but finally returned, when, upon assuring her that it would be of great help, she consented to the operation. All the irritated and irritating teeth were extracted. When asked if I was not going to prescribe for her, informed her I was not. Three months later she informed me that she had enjoyed splendid health since the operation."

Wallis, of London, is of the opinion that oral sepsis in children has more detrimental effect upon health than does improper mastication.[6] " He had considerable opportunity in the last few years of watching the effects of oral sepsis in London County Council school-children. In certain schools there were dental charts

[6] British Journal Dental Science. July, 1910, p. 591.

showing the weights and the average ages of the children, and these clearly showed that the children with the most septic mouths were not only below the average weight of their class, but were below the average intellectual status of their age. Those with the most highly septic mouths were frequently two standards below what they ought to be in accordance with their age. With regard to oral sepsis, it has been his plan at the hospital to have the patients weighed weekly after wholesale extractions of teeth; and, in spite of their being left unable to masticate their food, they progressively increased in weight, and at the end of a few months they had in nearly all cases gained several pounds. That seemed to show that the really serious matter was not so much the want of mastication, as the fact that they were constantly swallowing the products of decomposition and the micro-organisms of disease."

Diabetes. — Mr. Peter Daniel, surgeon, London, in a discussion upon a lecture by Dr. Ackerly on "Observation on the Condition of the Mouth in 1000 Consecutive Cases of Chronic Dis-

eases," said: "Another important matter was the relationship of diabetes to oral sepsis. A septic urethra or septic skull was not the same thing to a patient as a septic intestinal canal; the latter must be of the greatest potency in producing glycosuria, which every one agreed was due to pancreatic disease. Since 1900 he had seen 22 cases of complication of diabetes which had come into his hands as a surgeon, and he had never seen a clean-mouthed man or woman among them. In his opinion this disease occurred most frequently in the people who most neglected the hygiene of the mouth. In seeking for oral sepsis, the majority absolutely ignored the gums, crowns, and clasps of dentures, such data being really indispensable to any consideration of oral sepsis."

It has been the custom heretofore to look upon pyorrhœa alveolaris, which is almost always present in diabetes, as a result of the diabetic condition rather than a cause of this disease. There is no longer any doubt as to the possibility and the probability that oral sepsis is productive of septic disease of the pan-

creas by the passage of septic organisms from the intestine through the pancreatic duct.

Toxic Neuritis.—Dr. Wm. Hunter, in his monograph on oral sepsis, calls "attention for the first time to a new and hitherto unrecognized effect of prolonged oral sepsis, namely, toxic neuritis." This discovery was made during his studies of pernicious anæmia, in which he became impressed with the importance of oral sepsis in this disease. He found the frequent occurrence of nervous effects in pernicious anæmia—numbness, tingling in hands and feet, loss of knee-jerk, marked wasting of certain muscles, and local palsies—were exactly duplicated in connection with *extreme cases of oral sepsis,* apart altogether from pernicious anæmia. He appends the notes of three cases which had recently come under his observation. In all of the cases the nervous effects were very marked. In all the most intense condition of oral sepsis prevailed, lasting for many years, in one case for fourteen years, and in all the cases immediate improvement resulted from a correction of this condition.

The question which naturally arises in this connection is, may not many of those cases of neuritis in various portions of the body, the etiology of which is so obscure, be due to toxæmia induced by a long-continued and intense condition of oral sepsis. The writer is aware that his interest in this particular subject of oral sepsis may lead him to over-estimate the possibilities and dangers associated with this condition, but, from the observation and study of the human mouth for a period of over forty-five years, the conviction has been gradually reached that an unclean, unsanitary, unhygienic, septic mouth is the greatest menace to individual and public health of which he has any knowledge; and that the very fact that this condition is so common and so generally unrecognized by the profession and the public generally, makes it all the more threatening and dangerous.

The surgeon and the accoucheur are often at a loss to account for septic conditions following an operation or a delivery in which apparently every precaution had been taken to prevent infection. Two sources of infection, however, are

almost never thought of,—namely, the mouths of the surgeon or the accoucheur, and their assistants present at the operation or delivery, and the mouth of the patient. The mere covering of the mouth and nose with a piece of gauze is not a sufficient protection against infection of the seat of operation when a septic mouth—a sometimes horribly septic mouth—lies just behind it, emitting with every breath or every explosive act of speech myriads of septic organisms which infect the air surrounding the field of operation and the whole room.

With patients suffering from septic conditions of the mouth, entrance of pyogenic organisms to the blood and lymphatic streams is more or less constantly taking place, thus endangering every operation made upon the patient through the presence of septic organisms in the blood and lymph, which lodge and rapidly multiply in tissues that have been injured by any cause whatsoever.

No surgeon or accoucheur should approach a patient until he has rendered his mouth as clean as possible by the use of the tooth-brush and plenty of sterile water, nor permit an assistant or a nurse

to be present at an operation or an accouchement without having taken the same precautions.

It is just as important to exclude the possibility of infection from the unclean mouths of the operators and the attendants as it is to exclude the danger of infection from unclean hands, towels, sponges, instruments, ligatures, etc.

The careful surgeon before making a laparotomy will take a hot bath, shampoo his hair, and put on sterilized clothing, and require his attendants to do the same. Great care is exercised in scrubbing the hands, cleaning the finger-nails, and rendering them as sterile as possible. As an extra precaution, all wear sterilized rubber gloves, and a sterilized cap over the hair, and a piece of gauze over the nose and mouth. But how many ever take the same care to render the mouth clean before operation? Not one in a thousand. How many think of the necessity of having the mouth of the patient cleaned before an operation? Not one in a thousand, if the operation does not involve that region.

No good surgeon or accoucheur ever forgets to have the field of his operation

rendered as perfectly sterile as soap and water, the scrubbing brush, and antiseptics will make it. Yet how many ever think to examine the mouth for infections that may endanger the success of his operation? Or how many accoucheurs ever realize that a septic mouth may endanger the future health or possibly the life of his patient?

The mouth and teeth of every surgical or lying-in patient should be examined and such necessary dental service rendered as will remove all danger of septic infection before the operation or accouchement takes place. It may not always be possible to accomplish this with the surgical patients, but with the obstetrical cases this service can usually be rendered. If teeth have to be extracted, anæsthetics should be employed to prevent shock.

All operations upon the stomach or intestines, including the appendix, should be preceded, when possible, by preliminary attention to the teeth and mouth. Sepsis of the oral cavity should be corrected before any serious or important operation upon the abdominal viscera is attempted if auto-infection is to be prevented.

CHAPTER XII.

THE PSYCHOLOGICAL EFFECTS OF DENTAL AND ORAL DISEASES AND SEPSIS.

One of the marked symptoms of oral sepsis in children is mental inefficiency, and this is always associated with a more or less serious deficiency in the normal standards of health. These children are, as a rule, pale, listless, and under weight; usually complaining of headache, frequently of toothache, and are subject to periods of constipation and diarrhœa. Many of them upon a close examination will be found to have enlarged tonsils, or adenoids, or both. They are subject to frequent catarrhal attacks of the nasal passages and throat, and not infrequently to cough which persists all through the winter and spring months, thus materially interfering with school attendance and placing them in the list of backward children.

Errors in nutrition and septic intoxication are the prime causes of mental inefficiency in children that are born normal. These errors may arise from diseases of

the teeth and the soft tissues of the mouth, which make normal mastication an impossibility, thus interfering with the processes of digestion and assimilation, and loading the system with the poisons of fermentation and putrefaction of food, which are constantly going on in the stomach and bowels under these circumstances, thus preventing a proper and healthful nutrition and growth of the body.

Similar conditions may arise from a septic condition of the mouth, but it would be difficult to find a septic mouth in which dental decay and inflammation of the gums and mucous membrane were not present in some of their numerous manifestations.

The adult mouth is sometimes in a very septic condition when few or no natural teeth are present, but which contains artificial dentures that are not kept in a sanitary condition. Occasionally an individual will be found wearing artificial dentures which have been placed in the mouth over a number of decayed and suppurating roots of teeth, or an extensive bridge has been permanently set in

the mouth under like conditions. A more dangerous proceeding than this could hardly be imagined. Some of the most serious cases of oral sepsis associated with neurasthenia, depression, and melancholy that have come under the observation of the writer have been due to this reprehensible practice.

Enlarged tonsils and adenoids are also fruitful sources of malnutrition and retarded growth in children. Proper oxygenation of the blood is just as important in the nutrition of the tissues and the growth of the body as are the carbohydrates, the albuminoids, and the mineral constituents of food. A child with narrow or more or less occluded nasal passages is never in a healthy or robust physical condition. Imperfect oxygenation of the blood is the result of contracted air-passages, and this leads not only to imperfect physical development but to imperfect mental development as well. These children are almost always dull and sluggish in their mental processes, and occasionally give the impression of being mentally deficient, when really the trouble is due to an inefficient elimina-

tion of the waste products in the blood and its proper oxygenation.

Prof. James says, " No mental modification ever occurs which is not accompanied or followed by a bodily change." It may be said with equal truth that no important physical change ever occurs without leaving its impress upon the mind. A crooked back often produces a crooked disposition.

Burr says, " Disturbance in the structure or the functions of the brain interferes with the play of emotion and the faculty of ideation. Serious and long-continued impairment of its nutrition displays itself in settled perversions of thought and feeling. Injury resulting in cerebral concussion may cause temporary or permanent suspension of intellection, and defects in cerebral development are accompanied by partial or complete absence of the higher psychical processes. A child is born into the world the structure of whose brain is anatomically deficient or the growth of which is impeded by mechanical compression. The result is idiocy or imbecility; the development of

the higher intelligence, of judgment, and reasoning is impossible."

Persistent malnutrition of the body sooner or later shows its pernicious effects upon the processes of the mind. This is particularly marked in children who are approaching the period of pubescence. This is the period when the parents and teachers begin to notice in the child a lack of concentration and interest in study; perhaps an irritability in temper and a disposition to contentiouness is developed, or the child becomes dull and apathetic, loses interest in play, and perhaps shows more or less distaste for association with friends. The child falls behind in the school work, perhaps becomes discouraged and either wants to leave school or plays truant; or a vicious temper may develop which constantly gets the individual into trouble with teachers and associates; or a disposition to untruthfulness is developed, or to appropriate, for individual use or otherwise, property belonging to another. These conditions are all the result of a disordered mind dependent upon the malnutrition

and septic poisoning from which the child is suffering, and call for medical, surgical, and dental aid, and sympathy from those responsible for the up-bringing of these unfortunate children. But left to themselves, without proper treatment, and constantly reprimanded and punished for their derelictions, for which they are only partially responsible, they soon become the incorrigibles of the school and later may enter the ranks of the criminal class.

The period of pubescence is one of great importance in the development of children. During this period—in this climate between the ages of 13 and 15 years—the boy or girl passes from childhood to manhood or womanhood. At this period great physical changes take place. The organs of reproduction begin to assume their function and decided changes in the personal characteristics of the individual take place. It is a most critical period in the life of the boy or girl, a period when the greatest wisdom is called for upon the part of parents and teachers to guide them aright. It is at this time that children with neurotic tendencies are apt to develop undesirable traits of character,

or that those who have inherited tendencies to unstability of mind are liable to suffer from mental disease.

In those with an unstable nervous system — neurotics — chorea, neurasthenia, and epilepsy may be developed as a result of the added nervous strain caused by the establishment of new functions, and the mental anxiety often manifested by those who, through ignorance of the cause for these changes in their physical condition, are unable to understand them. It is positively wicked for parents or those who have the charge of rearing children to allow them to approach this important period in their lives without preparing them to understand—of course in a modest way, such as a true father and mother will know how to do—these changes in bodily functions, and the new desires and aspirations which go with them.

The writer has seen many cases of chorea in growing children that were directly traceable to irritation from bad teeth, superimposed upon an unstable nervous organization, or upon a nervous system weakened by too close application and too long hours spent over their

school work and in which they were taxing their nervous energy to the limit of endurance.

Inattention in children is always the result of nerve exhaustion.

A tired person, either child or man, cannot fix the attention upon any subject, no matter how interesting, except for a short period of time. The mind constantly wanders to other things, and when brought back to the subject by an effort of will it cannot be held. Concentration seems impossible. The child who is suffering from nerve exhaustion inherited or acquired, in the form of hysteria or neurasthenia, is unable to fix the attention upon his studies, he lacks concentration of attention, and consequently he falls behind the healthy child and is soon classed with the backward and delinquent children.

When the writer was a boy in school, inattention and lack of concentration upon the work in hand was considered a "*willful disobedience,*" and punished with stripes from a vicious rattan, and this with as little justice as would have been the punishment of a child positively ill.

In 75 per cent. of cases of inattention, the child is a sick child, for his nerves are tired. He was either born so or he has become so through unhygienic and unsanitary methods of living, and he is no more responsible for his inattention and inability to concentrate his mind upon his studies than he would be if sick from any other cause. Children of this character are completely incapacitated for prolonged serious application to any form of mental labor.

American children are, as a rule, endowed with a very sensitive nervous organization, and are therefore more liable to a nervous break-down under severe stress than are children with a more phlegmatic temperament.

The correction of irregularities of the teeth by mechanical means is often responsible for the establishment of nervous affections when the operation is too rapidly performed, particularly if the child possesses a highly endowed nervous organization, or is under heavy and exacting mental and nervous strain from ill-advised crowding in school work.

When any severe strain is to be placed

upon the nervous endurance of a growing child, like that of correcting irregularities of the teeth, or expanding the dental arch and superior maxillary bones, to increase the width of the nasal passages so necessary in children with arrested development of these bones, and also during orthopædic operations, they should be relieved of all school work and all other tax upon nervous energy. Orthodontists and orthopædists are beginning to appreciate this fact, and children who are undergoing these operations are not so often compelled to suffer such undue nervous strain as formerly.

Epilepsy may also be developed in the same way under like circumstances. It is a question therefore of considerable importance whether children who have inherited a neurotic temperament, with a tendency to epilepsy or insanity, should ever be submitted to any undue strain of this kind.

In persons of neurotic temperament, whether children or adults, slight irritations are sometimes productive of grave results, as, for instance, in the case of a young man about 20 years of age, who

came under the observation of the writer some years ago, who had developed symptoms of Jacksonian epilepsy, and was referred to him for critical examination of the teeth, but in which no dental disease was discernible. Later the patient underwent another and more exacting general physical examination, when the only lesion that could be discovered was a slight *fissure in ano*—fissure of the rectum. The cure of this lesion, which had caused but slight irritation and discomfort, removed all the symptoms of Jacksonian epilepsy.

Professor Upson [1] mentions a young physician who was apparently a confirmed *neurasthenic,* but was permanently cured upon the discovery and excision of a rectal ulcer.

[1] Cleveland Medical Journal, 1909, p. 455,

CHAPTER XIII.

THE PSYCHOLOGICAL EFFECTS OF PHYSICAL DEFORMITIES.

DEFORMITIES of the body, whether of congenital or acquired origin, often warp the disposition of an otherwise correct child, and later develop thoughts, tendencies, and actions which, if neglected, may become the forerunners of a perverted, vicious, immoral, or criminal life.

It is a well-known fact that irregularities of the teeth and malformations of the jaws are common among the insane and the habitual criminals.

In a joint paper upon "Studies of Criminals" [1] prepared by Drs. G. Frank Lydston and E. S. Talbot, of Chicago, in 1881, they give the results of the examination of 477 criminals of the habitual class, confined in the State penitentiary at Joliet, Ill., of whom 468 were males and 9 were females. Of the whole number three were Chinese, 18 were negroes,

[1] Talbot's Osseous Deformities of the Head, Face, Jaws, and Teeth, third edition.

and the remainder were whites. These criminals were examined for the purpose of ascertaining how many of them had osseous deformities of the head, face, and teeth, with the result that 63.94 per cent. out of this number had some form of osseous deformity of the jaws and malarrangement of the teeth. In the majority of the negroes the jaws were well developed. One had a partial V-shaped dental arch, one a saddle-shaped, one a V-shaped arch, and in one the left body of the lower jaw was found to be much smaller than the right. The bones of the head and face were also well developed.

The three Chinese were all sub-microcephalic—small headed—with very small jaws, and two of these had saddle-shaped dental arches. "It is worthy of note," they say, "that the nine females examined had large and well-developed jaws with normal dental arches."

The histories of these cases "plainly show at a glance the physical degeneracy and often the bad heredity of the subjects." They also invite attention to a noteworthy fact, that "The cases which most nearly approximated the normal

type of development were in sporadic criminals. The most markedly aberrant types were found in the imported criminals."

Defects of the palate, both in the bony vault and in the velum, are common among the defective and degenerate classes. Talbot reports having found congenital division of the palate in 14 out of 150 prostitutes, vicious implantation of the teeth in 62, anomalies of the facial bones in 64. In 700 cases of insane patients confined in the Dunning Asylum, Cook County, Illinois, taken at random, and of whom 430 were men and 270 were women, he found 214 with abnormal development of the maxillary bones.

Dr. Henry J. Jaulusz, of Pittsburgh,[2] declares: "The child with poor teeth probably will become the murderer, burglar, or defective of the future. The embryo criminal may be changed into a preacher or a great civic teacher by a simple dental operation. The teeth of children charged with crime should be examined by an expert, and if found defective they should be put in first-class

[2] Oral Hygiene, March, 1911, p. 176.

order by the State." He declared also, "that he could tell instantly by looking at the teeth of a child what the criminal tendencies are, if any exist. (?) After numerous tests, I am convinced that it is more important to look after a child's teeth than to send him to Sunday School or to a reformatory. The teeth of the majority of children are neither properly cleaned nor regulated.

"It is certain that abnormal ideas will take possession of the child's mind under these circumstances. Take the case of a tooth that is too close to another: the life-feeding vessels are cut off. The nerves become inflamed. The inflammation proceeds along the channels to the brain. It is the same with decayed teeth. The trouble goes to the brain and creates abnormal ideas and vicious tendencies. Among sixty-two deficient children I examined in New York schools, I found all had defective dental organisms. Not one of them knew the Lord's Prayer, and several of them had never heard of God. They were reported as cruel to animals, prone to lie, steal, and disobey their superiors.

"Statistics gathered by Mr. Howell Cheney, of the Connecticut State Board of Education, on the relation existing between physical defects of school-children and their retardation in the grades, show conclusively that children who are retarded are almost invariably physically defective and that among the most important defects are decayed teeth." (Supt. Buckley.)

Dr. James A. Britton, the Detention House physician of Chicago, says, "We have every reason to believe that an aching tooth is frequently the first cause of irregularity in school attendance, and every one knows that irregularity in school attendance is one of the first steps towards the juvenile court."

The case of Morris Krause, found in the report of the tests made at the Marion school (Part III), is a remarkable showing of what may be accomplished by oral hygiene and dental treatment under the most adverse circumstances that could be imagined. This boy was reported as the terror of the school, lawless, selfish, untrained, incorrigible, a truancy case, and one year behind his grade. His oral con-

dition was among the worst in the class. This boy, under proper hygienic care of the mouth and the curing of the diseased oral conditions, was changed to one of health and happiness. From the terror of the school, he became a conscientious, diligent, faithful student, interested in his work, and made the highest increase in efficiency of any child in the class. His record shows an increase for the first ten months of the test of 204.3 per cent.

Irregular teeth together with ill care are, according to Dr. John F. Detweiler, of London,[3] conducive to crime. He says: "From statistics which myself and others have gathered, we have traced a remarkable percentage of crime among men and women under thirty years of age to bad teeth. The Dental League, of London, co-operates with the London constables in collecting these figures, and I have made many examinations of persons who have been arrested.

"Teeth which are not perfectly aligned in the mouth seem to make persons unreliable and finally give them a criminal instinct. This discovery is in its infancy,

[3] Oral Hygiene, April, 1911.

and I believe many strides will be made along this line in the course of the next few years."

In speaking of the results of the examination and treatment of the teeth of the school-children he said: "It has been most successful. We have kept records of the patients, seeing what progress they made before and after treatment. In nearly every case, after the teeth had been treated, there was marked improvement in the pupil's work at school."

Children with narrow, contracted upper jaws and irregular teeth have correspondingly contracted nasal passages and very often abnormal growths in these passages, such as enlarged turbinates, thickened mucous membranes, deflected septum, or adenoids, which further constrict the air-passages and decrease the amount of oxygen entering the lungs, thus materially interfering with healthy growth of body and mind, and rendering these unfortunate children nervous, irritable in disposition, and dull in intellect.

Such children by the perversion of their natural healthy tendencies, through these physical defects, often become morose,

suspicious, contentious, incorrigibles that cannot be governed at home, and who, if sent to schools of correction, are only made more incorrigible by their treatment, and when released are apt to develop criminal tendencies, if they have not already been developed through unjust treatment. These children do not deserve punishment, for they are not responsible for these tendencies. What they need is medical, surgical, and dental care. Instead of treating them as criminals and confining them in houses of correction, they should be placed in hospitals where these physical defects may be remedied and they be given an even chance in the world to become useful, self-respecting, honorable men and women.

Experimental work along these lines has already been undertaken by several surgeons in various cities of the United States, the results of which will be looked for with great interest. Judge De Lacy, of the Juvenile Court of Washington, D. C., has interested himself in these experiments, and is doing all he can to secure a proper recognition of the fact that many children become *immoral* and *criminal*

because of some physical disease or deformity that can be corrected by medical, surgical, and dental science and a prospective bad career changed into a good one.

Prof. H. S. Upson reports the case of a thoroughly bad young man, aged 21 years, confined in the Cleveland Workhouse, who was cured of his moral and mental aberrations by the removal of two impacted upper molars, two abscessed lower molars, and an upper lateral incisor which showed evidence of absorption and marked abscess. This young man was as a boy unusually bright, truthful, and honest. Was neurotic in temperament, nervous, and at times had tremors, when two years old had a convulsion, but none since. Father's aunt was insane, but no other evidences of mental or moral aberration in the family. Had a good record in study and deportment until he entered high school; was mischievous, but finished the course. Soon after, at the age of 16 years, he began to develop a penchant for stealing, burglarized several stores, and finally robbed a post-office, for which crime he served two years in a reforma-

tory. At the age of 19 years he was liberated from the reformatory and for a time thereafter engaged in various employments. Later was sentenced for 60 days to the reformatory for assault and battery, he having "held up" a man on the street. He was restless, irritable, and contentious; had violent "spells" when he raved about the house and dragged his bedding to the floor and slept upon the bare springs of his bed. Sometimes he talked to imaginary persons, or would hold his shoes in his hands and talk to them. Since the operations, he sleeps quietly, is seldom irritable, laughs naturally, is cheerful and happy, and has lost all desire to do wrong.

CHAPTER XIV.

ORAL SEPSIS AND REFLEX DENTAL IRRITATION AS CAUSES OF DRUNKENNESS, NEURASTHENIA, MELANCHOLIA, AND INSANITY.

DIPSOMANIA is a neurosis, usually inherited. It is characterized by an uncontrollable desire for indulgence in alcoholic stimulants, preceded by great nervous depression, restlessness, severe fatigue, inattention to duties, and irritability of temper.

The desire for indulgence in alcoholic stimulants comes in *storms or waves,* and in this respect is a characteristic neurosis. The intervals may be long or short, sometimes several months may intervene between the storms. These people often lead a dual life, occupying positions of honor and respectability in the communities in which they live, no one suspecting for a long time that they were given to periodic fits of the most degrading debauchery. They are always very careful to hide themselves during these times in some distant place where they are

unknown and not likely to be discovered.

Drunkards are degenerates, and belong to that class of degenerates that Maudsley and Ball designate as "border-land dwellers,"—that is, dwellers on the border-land between reason and pronounced madness.

Morel says, "Degeneracy is a morbid deviation from an original type." Fere says, "Vice, crime, and madness are only distinguishable from each other by social prejudice."

Most degenerates are lacking in the sense of morality, of right and wrong and are weak in will power. The dipsomaniac, when he is overtaken by one of his nerve storms, is unable to exercise his will power, and loses all sense of moral rectitude, and cares nothing for the right and wrong of his actions, either against himself or others. He will lie, steal, or even commit murder if need be, to gratify his insane desire for that which will, for the time being, lift him out of his awful depression and give him forgetfulness and oblivion. When the storm is on, he is irresponsible for his actions; he is insane.

Alcoholic indulgence, when carried to

excess, is always productive of physical disease. Chronic alcoholism is generally accompanied with pathologic changes in the blood-vessels, arteriosclerosis—hardening of the arteries; sclerosis of the liver—hardening of the liver; nephritis—inflammation of the kidneys; meningitis—inflammation of the covering membranes of the brain and spinal cord; and cerebral atrophy—wasting or starvation of the brain-cells. These pathologic changes result in progressive mental conditions, such as impairment of memory, loss of business acumen, disinclination for all mental processes. Thought and speech, which were originally refined, becomes coarse and vulgar; his dress untidy or slovenly. When reasoned with about his change in habits he feels that he is abused. Complains that his family and friends have all turned against him and that they are to blame for the misfortunes that have come upon him. Such an individual is a " border-land dweller."

In the preceding chapter the writer has called attention to the fact that deformities of the face, jaws, and teeth are very common in the criminal classes and

Fig. XX.

Showing Impacted Lower Supernumerary Molar. Dried Specimen. (After Dr. Cryer.)

Fig. XXI.

Impacted Cuspid, Upper Jaw. Dried specimen. (After Dr. Cryer.)

Fig. XXII.

Inverted Upper Third Molar. Living subject. (After Dr. Cryer.)

the insane, also that diseased conditions of the teeth and mouth and deformities of the face and jaws are common among the children who are charged with crime, and that in some cases the correction of the attendant deformity or diseased condition has resulted in a complete change for the better in both physical and mental conditions.

That many cases of drunkenness, neurasthenia, melancholia, and insanity are due to mental overwork, business worries, mental shock, physical shock from traumatic or surgical injuries, child-bearing, pelvic diseases, anæmia, general toxæmia from sepsis or the continued fevers, specific disease, and heredity, etc., all will agree; but it is a new thought that there may be added to this long list of causes, oral sepsis, the irritations and perversions of functions due to deformities of the teeth, face, and jaws and to reflex dental irritations from malposed or impacted teeth. (Figs. XX, XXI, XXII.)

Prof. H. S. Upson found in his investigations upon the relationship of dental diseases to moral aberration, that irritations of practically a painless character

were frequently responsible, as the sequel showed, for grave mental conditions.

" In the course of an investigation upon the subject of impacted and otherwise diseased teeth in causing insanity," he says, " I examined in the winter of 1908–09 eighteen of the younger inmates of the Cleveland Workhouse with a special view to impaction of teeth, and incidentally a few of the older men for other lesions. Of the eighteen cases, ranging from 18 to 25 years of age, twelve showed multiple impactions.

" A number of these were operated upon and a part of the irritation removed. It was difficult to obtain histories, and in most instances impossible to follow the cases and give them adequate relief from the various lesions from which they suffered. In the course of the investigation three older patients were seen incidentally, and operated upon as a matter of faint hope but without much expectation of a favorable result. The outcome, however, has been unexpectedly favorable in two cases; no report has been received from the other one.

" One patient, Tom L., had been com-

mitted to the institution ninety-three times during the last thirty years for drunkenness and fighting. Although liquor always made him obstreperous, he was, when sober, very anxious to stop drinking and was pleasant and capable. Radiographs showed abscesses at the roots of two old stumps of teeth. These were extracted in February, 1909. Tom has since told me that before the extraction he had some toothache, severe pain in the head and sleeplessness, and in addition a periodic craving for drink which neither he nor any one else had ever connected with the dental manifestations. At the last report he had been entirely sober and faithfully working for fifteen months.

"The other patient, a woman forty years old, was also unusually capable and faithful in her sober moments. She had, however, been committed twenty or thirty times in the last ten years for drunkenness. She had been sleepless, had a good deal of headache in the temples and in the back of her head, and had suffered with terrible toothaches for several years past. The drinking had in her case never been associated by any one with her bad

teeth. She was well nourished and of fairly good color. On inspection, the nineteen remaining teeth in her jaws were all found to be badly decayed and the gums deeply ulcerated. They were extracted. Following their extraction she went on one more spree, but at last report had been entirely sober and at work for nine months.

"These patients appear to be cases of periodic aberration caused by pain. There is no evidence, however, to show that the craving for drink is in such cases really due to any pain recognized as such in consciousness, or localized in any way. It is rather the result of vague but intense emotion, in the form of either unrest, with depression, or elation, with its accompanying lack of self-control.

"Recovery in these cases seems to have been facilitated by an unusual original endowment, both moral and mental. Such mentalities, unless completely shattered, may return to a condition of stable equilibrium on the removal of even a long-continued irritant cause of aberration. The chances of recovery are of course much better in early cases."

This same investigator, in a preliminary report made to the Clinical and Pathological Section of the Cleveland Academy of Medicine upon the Effects of Oral Sepsis and Dental Irritation upon Neurotics and the Insane, [1] says: "I desire to call your attention to a familiar subject: the melancholy of toothache. The point is that the depression sometimes comes without the ache.

"The principal symptoms caused by dental lesions are: First, pain in the tooth; second, pain elsewhere, especially in the head; third, vasomotor symptoms, chills, thrills, flushes, sweating; fourth, insomnia; fifth, melancholy; sixth, muscular twitchings; seventh, fever, especially when pyorrhœa is present; eighth, rapid or irregular pulse. All of these symptoms are important. If in the absence of the diagnostic sign toothache, melancholy may run into melancholia; or if sweating, weakness, and flushing, caused by bad teeth, may constitute neurasthenia; or if insomnia, unaccompanied by dental pain, may result, it becomes important to make the diagnosis and remove the cause."

[1] Cleveland Medical Journal, vol. vi, p. 458.

He then outlines two cases, the first one evidently a case of septic irritation due to a devitalized tooth, and the other of reflex dental irritation due to an impacted third molar.

CASE I.—" A robust mechanic, aged 28 years. Three weeks before being seen, had been moodily accosted by his wife that she believed she was losing her mind. It immediately occurred to him that he might be losing his mind. He slept little that night or the succeeding nights, gave up his work, and spent his days in fear of the asylum. Tonics and assurances were of no avail. The only lesion that could be discovered was dental caries. The filling of a deep cavity extending into the pulp was followed by prompt recovery and he returned to work. At no time had there been toothache or other pain, but dizziness and sweating had been noted.

CASE II.—"An unmarried woman, aged 27 years, a teacher. For a year had been profoundly melancholy, with intractable insomnia, delusions of various deadly sins, and entire hopelessness of recovery. Restlessness was extreme; tonics and

local uterine treatment were of no avail. As a last resort the teeth were examined. They were apparently in perfect condition. A radiograph showed, however, an impacted right upper third molar tooth pressing against the second molar, a condition obviously capable of causing irritation. The tooth was removed and in about a week the symptoms began to improve. Recovery was complete in six or eight weeks and has persisted for six months." He says further, "The inference is warranted that the teeth in melancholics, neurasthenics, and those afflicted with insomnia should share the honors of a medical examination equally with the contents of the chest, abdomen, and pelvis, and, when diseased, should be cured."

In a more recent paper,[2] "Painless Dental Disease as a Cause of Neurasthenia and Insanity," he says: "The object of the present paper is to put on record a few observations made during the past two years in a broad and important field, that relating to dental diseases in connection with nerve strain and with

[2] Cleveland Medical Journal, vol. viii, p. 447.

the psychoses, melancholia, mania, and dementia precox.

" Although typical cases may occur in which a diagnosis of one member of this nervous and mental group is warranted, in many patients the symptoms blend in such a way that no sharp dividing line can be drawn. Most of the mental cases are nervous, most of the nervous cases have a mental substratum.

" On the physical side there is an equal complexity of conditions. Diseases of the oral, abdominal, or pelvic viscera are present as an exciting cause in conditions of insomnia, simple depression, purely emotional excitement, and in the more severe degrees of emotional disorder with or without delusions, so that what one considered normal emotions verge by imperceptible gradations into severe cases of emotional and mental disorder. The physiologic and pathologic are one. It is necessary to proceed from the simple to the complex in sifting these cases, in order to determine whether some or all of them are, in their mental symptoms, dependent on underlying physical conditions.

" One of the simplest dental lesions is impaction. When a tooth is formed in the jaw-bone with its axis wrongly directed, it is often prevented by impact against another tooth from appearing outside the bone or through the gum. The result is pressure against the peridental membrane, in some instances accompanied by severe toothache or neuralgia. In most cases no such pain is present.

" Beginning with the known fact that an impacted tooth is not only a stigma—deformity—but a lesion, capable of causing agonizing pain, and the further fact that long-continued intense pain may cause delirium and insanity, in fact, that most pains are associated with consequent mental phenomena, experiment and observation must determine whether these severe nervous, mental, and moral symptoms are due to pain or may occur in the absence of pain."

In this connection he records from his private practice seven cases that were dependent upon reflex dental irritation or septic conditions of the mouth.

Case I " was one of insomnia and mild

melancholia in a merchant 40 years of age. Trouble began four or five years ago by occasional attacks of sleeplessness and mental depression. Two years ago depression and insomnia became persistent and annoying. At times depression was followed by elation also attended by insomnia. These conditions were improved by rest and became worse by work and worry. Had no headache, no neuralgia, and no toothache, except occasionally from an ulcerated tooth, which was relieved by evacuating the pus. Had parted with three molar teeth during the last four years on account of abscess at the roots. Radiograph showed left upper third molar was impacted against the roots of the second molar, high in the jaw-bone. The second molar was dead, but showed no evidences of abscess. Both teeth were extracted. The roots of the second molar showed evidences of absorption from pressure. The patient made a progressive recovery. Sleep was better two nights after the operation. Depression has disappeared and the patient has made a practical return to health."

Case II " is one of severe delusional and suicidal melancholia in a teacher 27

years old. When first seen she had been profoundly melancholy for more than a year. Had persistent insomnia and many delusions, that her mind was gone, had never been quite sane, and that she had committed various dreadful sins. Treatment by tonics, by suggestion, change of scene, and treatment of the uterus were of no avail. After a year of useless effort the teeth were examined, and found in apparently normal condition. Radiograph showed an impacted upper third molar which was removed under anæsthesia. Patient had never in her life suffered with a toothache or any other disease of the teeth or jaws. She began to sleep well within a week or ten days after the extraction of the tooth. Her return to normal health was steady, and was typical in the fact that the delusions persisted longer than the melancholy. In such patients it is practically invariable that the emotional health is recovered first and the delusions are got rid of after. The only physical disease in this case was the impacted tooth; the other viscera throughout being healthy. The recovery has been complete."

Case III " is an example of dementia

precox in a man 41 years of age. Was well as a boy and until the age of 24; then he began to have periods of sleeplessness at intervals of six months or a year. After a few nights without sleep, would become flighty and irresponsible. Had some periods of catalepsy, and at times ran away from the institutions in which he was being treated. During the intervals when he had a fair amount of sleep his mental condition was better, but was far from normal, being irritable and of unhappy disposition.

"Examination disclosed an impacted upper third molar, moderately angled against the second molar. The third molar was extracted. For several months previously the patient had been suffering from insomnia, but began to sleep better and to feel more quiet two or three days after the operation. The gain in health has been progressive over several months, and he has since been in a thoroughly normal condition. Does not sleep well without sedatives of some kind, but has lost his undue irritability and other accompanying symptoms."

Case IV "is one of dementia precox

of a severe and continuous type in a girl 19 years of age, who has for eight months drifted gradually into a condition of mental aberration. Her case was marked by an active and persistent obstinacy. She was so restless that she had to be restrained night and day. She resisted all attempt at control; her delusions were expressed more and more actively until her talk became mere mutterings. Moaned continually as if in distress, but denied any pain whatsoever. Was obstinately sleepless night after night. Loss of sleep, refusal to eat, and constant activity day and night had brought her to a miserable condition of pallor and emaciation. Etherization was necessary in order to take radiographs. A cuspid tooth and all third molar teeth were found impacted and removed. Improvement began in the symptoms within two weeks after the operation. Two or three months after the operation, she had a relapse following a digestive disturbance, which took the form of attacks of loud shrieking, which began early in the morning after awaking, and these attacks were continued for five or six weeks. Improvement, however,

was practically continuous; mental health was established within six or eight months after the operation. Has occasional severe headaches. Has an occasional sleepless night. The left lower molar, which is dead and the roots not filled to the ends, and the filling rough and overhanging, was not treated, and it is not certain that there may not be other dental difficulties at this time."

Cases V and VI "illustrate the fact that dental irritation of a severe type does not always result in insanity, but may cause nervous symptoms, neurasthenia, or disturbances in the functions of the internal viscera. These cases are father and son and show heredity in nervous and mental troubles. The father was a man of 57 years of age. When 13 or 14 years old began to show nervousness by biting his nails. Continued in fair health until 26 or 27 years old, when his digestion began to suffer. Had so-called nervous dyspepsia in a severe form, followed by prolapse and dilatation of the stomach, and has had a good deal of digestive trouble ever since. Radiograph revealed the right upper third molar in an im-

pacted position. Its removal was followed by prompt disappearance of a very annoying feeling of distress in the head which had been present for many years. It was not pain, but a maddening indefinite pressure, which caused restlessness and strong impulsion to escape from an intolerable tension. Relief has been complete for something over a year.

" In the son, the nervous manifestations go back to the time when he was four years old, when he had twitching of the face and the extremities. Otherwise he had been fairly well though not robust. At the age of 17 years he became considerably worse, the twitching was more marked and digestion and circulation had begun to fail perceptibly. Restlessness was extreme, but no organic disease could be found anywhere in the body. Radiographic examination showed an impacted right upper third molar tooth, almost identical in appearance with the one in the case of the father. In addition both lower third molars were impacted at a high angle, and the left upper third molar was retained high in the jaw. The third molars were all removed, but sufficient

time has not yet elapsed for complete recovery. He is at present convalescent, fairly well, working hard, and much less nervous."

CASE VII.—This is evidently a case of melancholia of a simple type due to slovenly dentistry, and, fortunately, was easily corrected.

"The patient, a woman 37 years old, had always been well until three or four years ago, when she began to experience a curious feeling in her throat when she swallowed, but without pain. The feeling was sometimes better, sometimes worse. For several years had been much depressed. Worries about her health and other things; has at times been sleepless. Has had no toothache and no headache, but had one attack of facial neuralgia which stopped after treatment of the diseased roots of a tooth in the lower jaw. Examination of the teeth showed them in fair condition, but with a good many ragged fillings and badly fitting bridges. Upon the correction of these conditions by the dentist, she promptly recovered from her melancholy, and at last accounts was almost free from the hysteric feeling in her throat."

PART III.

CHAPTER XV.

THE NATIONAL ORAL HYGIENE PROPAGANDA.

THE oral hygiene propaganda recently established in this country by the Oral Hygiene Committee of the National Dental Association should receive the most active and interested support of our general and State governments, city and county boards of health, physicians, dentists, school-teachers, and the public generally. Similar movements had already been established in various sections of Germany and England and are doing great good.

This movement not only contemplates the establishment of free dental clinics, but goes much deeper into the subjects, for it proposes to take the advanced position that *prevention is better than cure.* With this end in view the Oral Hygiene Committee have proposed to enter the public schools and to begin their educational and practical work with the little children, selecting as their first field of labor the schools in the ghetto districts

of our large cities. In Cleveland, Ohio, Rochester, N. Y., New York City, Chicago, Ill., Washington, D. C., and various other large centres of population, the school boards and the boards of public health have become interested, and in some instances have appointed public lecturers and dental inspectors for the public schools, whose services are paid for from the public treasury.

The Oral Hygiene Committee and several dental societies have had lectures and lantern exhibits prepared, which may be obtained for public education free of cost. In this way it is hoped a general interest may be created in the public mind of the value of oral hygiene as an important public health measure, while dental and oral inspection and treatment will demonstrate the value of clean and healthful mouths as factors in establishing and maintaining a healthful condition of body and mind.

The Oral Hygiene Committee of the National Dental Association, in conjunction with the Oral Hygiene Committee of the State of Ohio, and the Cleveland Dental Society, with the co-operation of

the Cleveland School Board, recently established, at the Marion School in the ghetto of Cleveland, a severe test upon the value of oral hygiene as a promoter of general good health and mental activity. The following is a brief report of ten months' work in this school with a class of twenty-seven children, all of whom were classed as backward and delinquent children and all of whom had very bad teeth. In fact they were children selected by the dental inspector as having the most unclean mouths and the largest number of defective and diseased teeth of all the pupils in the whole school. The dental inspector examined eight hundred and forty-six children at the Marion school, and found that 97 per cent. were in need of dental and oral treatment.

REPORT.

"Cleveland, O., Feb. 18, 1911.

To the Honorable Members of the Board of Education, Cleveland, O.

Greeting:

The National Dental Association, the Ohio State Dental Society, and the Cleve-

land Dental Society beg leave to submit the following report relative to the work undertaken under a resolution adopted by your Honorable Board on November 1, 1909.

We regret our inability to render a report to you upon the date set for the same, but since January 1st our time has been devoted to securing statistics showing results of the work.

It is also a source of deep regret to us that, owing to the serious illness of one of the members of our committee who had the principal part of the work in charge, we were delayed in beginning the work for about three months; and as a result of this delay we were unable to complete all the work we had originally planned.

After securing the equipment and organizing our working forces, the committee became aware of the fact that, with the work scattered over as broad a territory as originally planned, it would be a very difficult matter to secure tabulated reports of results. It therefore seemed wise that a number of children, represent-

ing different classes and types of pupils to be found in the schools, be selected to make a careful and scientific test relative to the amount of improvement shown as a result of correcting unhealthy oral conditions.

In Marion School medical inspection had been in progress something over a period of three years, and whatever benefit was to be shown from the same would have had sufficient time to affect the records of the children in that school to such an extent that it would not make a perceptible difference in the records of the children. We therefore asked Miss O'Neill, the principal of the school, to select a class of forty children, twenty-seven of whom were faithful in carrying out the instruction given them relative to the care and use of the teeth. The class records of these children were taken for six months preceding the time they were received for care, treatment, and instruction; and, in addition to this, psychological tests were made under the direction of Prof. J. E. W. Wallin, which would show the working efficiency of the

child at the time he was received. These tests included "memory," "spontaneous association," "addition," "association by opposites," and "quickness and accuracy of perception" tests.

Here was found a considerable number of children who exhibited bad oral conditions, backward physical development, retarded mental progress, and unruly or immoral characteristics. Examination of many of the children and their school records showed that if the oral conditions were not the causes of the physical, mental, and moral backwardness, there was a striking parallelism. For the child whose mouth was unclean and incapable of proper mastication usually exhibited the conditions which the committee expected. That is, bad oral conditions, bad physical conditions, mental backwardness, and sulky or resentful or insubordinate moral attributes were all closely associated. If one started from the other end of the chain, the result seemed to be the same; that is, the child who was notably deficient physically, backward mentally, and insubordinate was found to exhibit bad oral conditions. Which-

ever end one started from, the answer was that the conditions ran so closely together that their relationships were worthy of investigation.

These children were then banded together and instructed in the care and use of the mouth and teeth, and a nurse, Mrs. Maud Van Gastle, placed over them to see that they followed out the instruction given them, and test meals were served to show them how to masticate their food properly. The mouths of these children were then to be put in first-class condition and their records taken, both their class and psychological records, during the time of treatment and for six months succeeding treatment. To date, six psychological tests have been made and the class records taken to January 23d; but the teeth of all the members of the class have not all been put in first-class condition. It is our purpose, with your permission, to make two more psychological tests upon these children and take the school records at the close of the school year, which will be about six months after their treatment has been completed, when we expect to be able to

show a very much larger increase than we have been able to show to date.

From the time the clinics were opened to date, the children have been undergoing the nervous strain incident to having dental work performed, therefore, their records would not be as good as under more favorable circumstances. The majority of the children selected for this class were repeaters, many of them were truancy cases.

As to the effect of our work upon this class, as relating to the records of the various children, we beg leave to submit the following report or statement from Miss O'Neill, principal of the school, which speaks for itself and shows the value of giving proper instruction in this line, from the educational side:"

"Marion School, Cleveland, O., Feb. 17, 1911.

Dr. W. G. Ebersole, Chairman of the Oral Hygiene Committee of the National Dental Association.

Dear Sir:

I am very glad to have the opportunity of expressing my opinion of the work of the special dental class.

As you no doubt remember, Dr. Krejci examined the mouths of the eight hundred and forty-six children at Marion School.

We selected forty of the children whose charts showed their mouths to be in a most serious condition.

Those forty children have been under treatment from May, 1910, till January 1, 1911. Their teeth were put into good condition; their habits of eating were supervised.

The results far excel any anticipations. In every instance the health has improved; the complexion has cleared; and with the attending physical uplift has come a self-respect that made them a very desirable element in school; which is more than can be said of several of them before we began this work.

We conducted a series of psychological tests planned by an expert.

The conditions have been carried out with the utmost care and precision, and the children have almost uniformly shown an improvement.

We believe it is a most conclusive test of the benefits that may be derived from a general care and attention to oral hygiene during the early years of life.

The asset of a good set of teeth and correct habits of eating and breathing will be of immense value to any child when entering upon his life career. We know that to-day a vast majority of our children are not so equipped.

Trusting that some provisions for overcoming those handicaps will soon be made in our schools, I am,

Very respectfully yours,
(Signed) CORDELIA L. O'NEILL,
Principal of Marion School."

"In support of Miss O'Neill's statement, we beg to submit a report or statement from Dr. J. E. W. Wallin:

"Skillman, N. J., Feb. 24, 1911.

Dr. W. C. Ebersole, Cleveland, O.

My Dear Sir:

The study of the effects of the application of proper operative and hygienic oral treatment upon the working efficiency, mental development, health, conduct, and regularity of attendance of public school-children, which was begun in Cleveland last May, is the first attempt, at least in this country, to investigate, by the scientific methods of controlled experimentation and systematic clinical and pedagogical observation, the dental phase of the problem of national human conservation. An analysis of the tabulated results of the serial psychological tests, of the principal's scholarship, and of the records of the medico-clinical examination of the pupils receiving dental treatment, demonstrates (1) the beneficence of the work thus far accomplished to the individual pupils, in overcoming the retardation

of mental functioning due to physical impediments; (2) the great immediate practical value of dental hygiene, as a financial investment, to the school system; (3) the great contribution which oral hygiene will make toward the conservation of the physical and mental vigor of our people; and (4) the great desirability of making provisions for continuing the work of investigation inaugurated in Cleveland, along more extended lines. The amount of improvement in some of the mental traits and capacities, as shown by the successive psychological tests, with which I have been associated, is phenomenally large in some of the cases. In one-half (thirteen) of the twenty-six cases, for which I have the data, the average percentage of improvement in the functions measured ranges from 27 per cent. to 168 per cent. In only three cases is the gain less than three per cent. (two of these being negative). Making due allowance for natural growth, practice, and familiarity, there remains a large margin of improvement which is directly traceable to the prophylactic, hygienic, and operative treatment. I feel persuaded that we have here a weapon with which to combat race degeneration and pedagogical retardation which it would be unwise and uneconomical not to utilize in increasing measure.

Yours very truly,

(Signed) J. E. W. Wallin,

Director of Laboratory of Clinical Psychology in the New Jersey State Village for Epileptics."

" Subsequent to and in support of Miss O'Neill's and Dr. Wallin's reports or statements, we herewith submit a tabulated statement of the condition of each child before treatment and instruction, and attached hereto will be be found said tabulated report.[1]

We wish to say, that, of the twenty-seven children in this class, all but two show marked improvement in working efficiency—Jacob Bernstein shows a loss of two-tenths of 1 per cent., and Beatrice Kramer a loss of 1.8 per cent. It has been found that, while Jacob Bernstein shows a slight loss from the psychological standpoint, his school work shows an increase of 19 per cent. in working efficiency.

The highest increase in working efficiency was made by Morris Krause, who when taken into the class was lawless, selfish, and untrained, a truancy case, one year behind grade. This boy shows an increase of 204.3 per cent.

All statements relative to the members of this class, either as to original conditions or final results, are based upon ac-

[1] Copies of these reports may be obtained upon application to the Superintendent of Public Schools, Cleveland, Ohio.

tual facts and existing conditions, supported by indisputable records and tests. And all reports and statements have been rigidly censored by Miss O'Neill, principal of Marion School, whose aim and ambition has been to see that nothing but the plain and unvarnished facts be given to the world at large.

All records, tests, and information from which these reports are taken are at the command of those interested, and the most careful and rigid investigation as to the accuracy of the same is invited.

The investigation and experimentation herewith reported is the first careful and systematic effort made by both the dental and educational authorities to prove the actual value of healthy oral conditions; and the records herein contained will be the means of working a complete revolution in the methods and manner of conducting and practising hygiene and sanitation, not only in connection with the public schools, but other educational institutions as well, and the day is fast coming when the " powers that be " will be far more insistent upon a statement certifying to the healthy condition of the

mouth than they will for a statement that the child has been vaccinated.

The average increase in working efficiency for the class of twenty-seven children is 37.44 per cent.

The data from which these statistics were secured have been carefully preserved for your inspection and consideration, should you desire to investigate the correctness of this report.

Our committees wish to state to your honorable body that the increase shown in working efficiency to date has exceeded their fondest expectations, and we are fully convinced, that, when the children have had an opportunity to work free from the handicap of having the dental work done, they will show an increase of over 50 per cent. in working efficiency due to the proper teaching of the CARE and USE of the mouth and teeth.

The value of dental service, which includes instruction not only in the proper care of the mouth and teeth but in the use of the same, is shown when we bring to your attention the fact that by examinations made in June, 1909, in four representative schools in Cleveland, it was

found that 97 per cent. of the public-school children were in need of dental care and treatment, and to-day we come to you with actual records obtained from pupils in one of these schools showing an average increase in working efficiency of practically 37½ per cent., and this before treatment is completed or the final tests made.

Dental caries, or decay of the teeth, is the most prevalent disease of modern civilization, and is just as readily transferred from child to child and from adult to adult as are the organisms which produce scarlet fever, diphtheria, pneumonia, and tuberculosis; and it is producing far greater havoc than all other diseases put together, as the records obtained through your kindness will show.

The committees firmly believe that instruction given in the schools in the proper care and use of the teeth and mouth would save thousands of dollars annually to the State and municipality in the education of their wards, and this great saving too would be made in addition to all expenses entailed in taking care of the mouths of those children who could not afford to

have the same done by the dental profession.

To illustrate in a most conservative way our reason for making the above statement, we will say that we have found that 97 per cent. of our public-school children are in need of care and treatment. Records obtained from the experimental class at Marion School to date show an average increase in working efficiency of 37.44 per cent. from a psychological stand-point. These children were selected because they showed the worst oral conditions, and the records were obtained when the children were undergoing the physical and mental strain of having these faulty oral conditions corrected. The dental work has been completed; but the period of experimentation does not end until June 1st, when the children will have had an opportunity of working for a few months free from faulty oral conditions and the nervous and physical strain of having such conditions corrected. When the period of experimentation has ended, judging the future by the knowledge and records obtained from the past, the committees feel that it is reasonably

conservative when they say that these tests will show at least 50 per cent. as the average increase in the case of these children.

With 97 per cent. of the public-school children in need of care and treatment, and with the worst oral conditions showing an improvement of from 37½ per cent. to 50 per cent. in working efficiency, would it not be conservative to consider that, with all the faulty oral conditions corrected and the mouths in first-class condition, there might be an average increase of at least 10 per cent. in working efficiency for all the children in the schools?

If it costs $21.00 per child per year in the elementary schools for instruction alone, to get the cost of educating the child you must add to this cost the cost of equipment and maintenance. You must add to this $21.00, according to the statement of Assistant Superintendent Bachman, at least 25 per cent. We therefore find that it costs us approximately $26.25 a year to educate a child in the elementary schools. Then, from our conservative estimate of 10 per cent. increase in work-

ing efficiency of every child in the public schools, we find that each child is doing 10 per cent. less than he could do under normal conditions, and we are therefore paying 10 per cent. more for the education of that child than would be necessary under normal conditions to bring about the same results; or, to look at it from another stand-point, we could do 10 per cent. more or better work in the elementary schools at the same cost. If it is costing us 10 per cent. more to educate a child per year, then we are paying $2.62½ per year more for each child in our elementary schools than would be necessary under normal conditions.

The records of 1909 and 1910 show a registration of practically 65,000 pupils in the elementary schools, and therefore upon the above basis of figuring we would show an expenditure of $170,625.00 a year to educate children handicapped by faulty oral conditions; but, in making the above estimate, our committees placed their percentage at a figure which they are positive is less than half of what actual tests would show. And, if we double the above amount, we find that we

are spending $341,250.00 per year to overcome the handicap of faulty oral conditions, most of which can be successfully overcome and prevented by proper instruction in the correct care and use of the mouth and teeth.

The condition of the mouths of the school-children of this country, which has been growing worse instead of better, is simply appalling. The loss in health, strength, and beauty is most alarming; while the seeming utter indifference to such a condition on the part of both profession and laymen has been most astonishing. Such a condition must be met and overcome; and in meeting and handling this important problem the undersigned will be glad to extend their counsel and aid.

Thanking your honorable body for the kindnesses and courtesies extended, we beg to remain,

Respectfully yours,

ORAL HYGIENE COMMITTEE OF THE
NATIONAL DENTAL ASSOCIATION,
W. G. EBERSOLE, *Chairman.*"

The final report of this committee upon the scientific tests made through this class

of twenty-seven children was presented to the National Dental Association in the latter part of July at Cleveland, Ohio. The final psychologic tests were made early in May during the closing examinations of the school year. It was the pleasure of the writer to be present, with a number of prominent official and educational people, to witness these psychologic tests, and it is our privilege to state that the tests were severe and absolutely fair. The assembled company were invited to take the tests with the children, and several complied, but were in every instance outdistanced by the class. To those readers who are interested in the full details of the remarkable showing of this first scientific test upon the value of clean and healthful mouths and teeth and proper use of the teeth in mastication, we refer them to the Transactions of the National Dental Association, 1911, published by the S. S. White Dental Manufacturing Company, Philadelphia, Pa.

The following is a brief summary of the final report of the chairman of the committee and of the final report of Miss O'Neill, principal of the Marion School.

REPORT OF THE CHAIRMAN.

Effect of the Oral Hygiene Campaign on the Status of Dentistry.

Finally your committee believes that the facts and records herewith presented comprise one of the most valuable, if not the most valuable, scientific discovery in the history of dentistry.

I want, personally, to say to the president and to the members of the National Dental Association, that it was the National oral hygiene campaign, as planned and conducted by your committee, that made it possible for the profession to receive the rank and recognition accorded it during the past year by municipal, state, and national governments.

To-night this committee comes to you with the records obtained in carrying out a part of its policies, which places the dental profession in a position to prove in dollars and cents the actual value of its services to mankind.

It shows that in health conservation dental service plays so important a part that no other profession can equal, let alone excel it in the value of services rendered.

REPORT OF MISS O'NEILL.

"We are to-day in the maelstrom of a movement for conservation: waste and loss are measured from every stand-point; the gospel of

efficiency is being preached in every line of business. The scientific management even of the shovelling of ore, the laying of brick, or the manufacture of machinery is studied until the efficiency of the workman is raised to the highest degree, and loss of time or labor reduced to a minimum.

THE ENVIRONMENT OF THE MODERN CITY-SCHOOL CHILD, AND ITS EFFECTS.

If we allow ourselves for a moment to think of the rapid changes that are being made in our mode of living, our methods of travel, and our conduct of life, we shall be impressed with the necessity for utilizing our forces to the greatest advantage.

This necessity is very marked in the field of education. In the year of 1830 but 5 per cent. of our population in the United States lived in the cities; to-day very close to 70 per cent. are so domiciled. Think of what that means to education! With 95 per cent. of the children out in the open fields, breathing the pure air of the country, nourished with food that had not undergone adulteration, and trained in the varied pursuits and crafts of the farmer boy and girl of that day, it is not surprising that little thought was given by the educator to the physical welfare of his pupil. . . .

When a child was close to nature, nature took care to correct the imperfections made by unintelligent civilization. But when outraged nature is overtaxed by the rush and hurry of a city existence, she refuses to cope with the situation, and we are rearing a race of weaklings for future citizenship.

The great need of conserving the child for the nation appeals strongly to us. We cannot send him back to the country to live; we must deal with the condition as it exists, hence the training for perfect life takes the place of his former simple life.

THE INCREASE OF EFFICIENCY OF SCHOOL-CHILDREN BY SCIENTIFIC MANAGEMENT.

The purpose of this paper is to give evidence of what may be done to increase the efficiency of the child if a scientific management be established.

An experiment along these lines has been made at Marion School. Marion School is situated in the congested section of the city, and its pupils come from eighteen city blocks, which territory also supplies pupils to three parochial schools. The conditions might furnish results that may be found in similar quarters in any city. It has also furnished a proof of what may be done in such a community by fostering the higher ideals of living.

MOUTH HYGIENE

DENTAL EXAMINATIONS OF THE MARION SCHOOL CHILDREN.

In June 1909 there appeared at our school one Monday morning ten dentists and ten nurses or attendants, sent, by previous arrangement with the board of education, to obtain an idea of the condition of the children's mouths.

Inspection was made of 846 children, and a dental chart was marked for each child. Out of the 846 examined just *three* children were found whose teeth were in perfect condition, one a colored boy eleven years old, another a Slavish girl of ten years who had been in America about six months, and one, an American-born child, aged twelve, who was of Russian parentage. One little lad was found to have three abscesses, two well developed and the third forming. (Would it be surprising if he annoyed his classmates or refused to conform to the simplest regulations of the school?)

Such a condition was naturally startling, and we were very much gratified to have the board of education authorize a more specific examination the next year.

Dr. L. A. Krejci conducted this examination at our school. Two classes of about forty children each were examined in a day. Duplicate charts were made, one being kept by the dentist and one sent to the parents of the

child. When the examinations of the schools were completed, Dr. Ebersole requested that a special class be formed for observation and study. The purpose was to ascertain what effect, if any, would be produced on the child physically, mentally, and morally by attention to the proper use and care of the oral cavity.

EFFECT OF MEDICAL SUPERVISION AT MARION SCHOOL.

For four years preceding the beginning of the dental work, we had at Marion School the volunteer services of a skilful and exceptionally well-equiped physician, who conducted the medical inspection of our children. His almost daily attention, aided somewhat by special emphasis on physical culture and daily rhythmic drill, had completely transformed the children in our school district. Though living under the same social, economic, and industrial conditions as pupils in adjacent school districts, the children at Marion School invariably impressed visitors, official or otherwise, as being children of a more fortunate type physically, morally, and mentally. Knowing, therefore, what medical inspection had done for us, I took precautions before beginning the dental experiment to so safeguard our medical record that no credit would go to the oral hygiene work that rightfully belonged to general medi-

cal efforts. I was willing to grasp and aid any additional movement for the betterment of the growing child, but each resource must stand on its own merits. While I was by no means antagonistic to the movement for oral hygiene, I was very jealous of the records that we had previously made in improving our children.

METHOD OF CONDUCTING THE ORAL HYGIENE TESTS AT MARION SCHOOL.

In order, therefore, that the Oral Hygiene Committee could not take credit for work done by others, I took the pains to secure written statements of conditions from reliable people who had seen the work. I have not needed to use them, and in fact have become more convinced than those who were trying to convince me.

If this was to be a scientific experiment, it must be conducted with the utmost accuracy possible. All of you who have dealt with children know that they can be made to perform phenomenal feats if skilfully handled. It was our firm determination to keep in every way possible the efforts and environment of these children absolutely normal, and have as little attention as possible directed to the children and to their work, and no undue pressure brought to bear.

Our sessions were held after school, when all other children had been dismissed for home.

Only what was absolutely necessary was ever said in the building concerning the work and the children. So little attention did they attract for the first six months that many of the teachers in the building did not know who of their own pupils were in the class. Of course the distribution of five-dollar gold pieces at Christmas time, of which I will speak later, made any further quietude an impossibility. Fortunately by that time our work was practically ended, and publicity could do no harm. Then, again, we conducted the psychological tests with as great a degree of uniformity and accuracy as was possible. In fact we can publicly vouch that nothing was in any way done that would influence a favorable result. What we have attained have been as nearly normal results as it is possible for human effort to attain, and are due, I believe, wholly to oral hygiene.

With a mental attitude as described we organized our dental squad. With the assistance of Dr. Krejci, the examining dentist, the charts for all the children, from the fourth to the seventh grade inclusive, were looked over. We did not consider any eighth-grade children, because they were soon to leave us for high school, nor any below the fourth grade, as their limited abilities would make the results of the psychological tests practically valueless to us.

Out of the entire number of charts forty

were selected that showed the greatest number of defects. We made no other condition in the selection. It developed that among the forty whose charts showed the worst condition were some of our best pupils and some of the opposite element; in fact it typically represented the school. This we deemed a most happy choice.

Conditions for the Marion School Dental Squad.—The forty children were assembled after school on May 18, 1910. Dr. Ebersole explained what was required of them: (1) They were to have their teeth put into perfect condition at no expense to themselves. (2) They were to brush their teeth carefully three times a day. (3) They were to masticate their food properly, not using liquid with solid food. (4) They were to attend any and every meeting of the class called, and take from time to time psychological tests, and were to conform to regulations laid down by Mrs. Van Gastle, who was to act in the capacity of supervising nurse. As a reward for this cooperation each child who faithfully lived up to the requirements was to receive a five-dollar gold piece on the Friday preceding Christmas. To make the reward more tangible and real, Dr. Ebersole gave the gold pieces to me in the presence of the children, and I held them in trust for them. It was necessary that some-

thing attractive be offered to have their faithful co-operation. It could hardly be expected that the juvenile mind would appreciate the value of experimental proofs of dental prophylaxis, and from a purely altruistic motive conform to a series of new and taxing regulations, hence the wisdom of the reward in gold. At this time, also, each child was given a tooth-brush, a bottle of tooth-powder, and a plain drinking glass. Dr. Ebersole thoroughly explained the process of brushing the teeth, which to some of the children was something entirely new. Immdiately five withdrew because they would not assume the burden. Of those who remained, seven were in the seventh grade, thirteen in the sixth, nine in the fifth, six in the fourth grades. Later, at different times, three were dropped from the class because of failure to attend the tests, and five were dropped beause they did not keep their teeth clean and live up to the rules generally, leaving twenty-seven who remained faithful to the end.

Psychological Tests.—There were a set of six psychological tests prepared by Dr. Wallin, the psychological expert. The tests were planned to ascertain standards in memory, accuracy of perception, rapidity and accuracy of thought, and spontaneity of association and differentiation.

Six tests were given, two before the work

was begun on the children's teeth, two while the work was being done, and two a sufficient length of time after the mouth had been put in perfect condition.

Lessons in Mastication and Insalivation.—Two special tests were given in the interim merely to illustrate to some interested parties what was being done. In June, 1910, about four weeks after the beginning of the work, a practical lesson in mastication and insalivation was given by Mrs. Van Gastle, the nurse. Puffed wheat and cream were served the children, and they partook of the food, chewed and swallowed according to directions.

At this time the process and necessity of properly chewing the food were carefully explained, and all questions asked by the children were carefully and minutely answered. This started them intelligently in that phase of the work.

Lessons in the Use of the Tooth-brush.—In September, 1910, the children were assembled and tested as to their ability to brush their teeth. They showed a vast improvement over what they had been able to do in the beginning.

Test Dinner.—They were then invited to a three-course dinner, prepared by the school and served in the building. The meal consisted of roast beef, potatoes, tomato salad, wafers,

grape jelly, and dessert. After they had finished eating, each child was served a glass of water.

At that meeting one of the boys said that he had been in the habit of drinking six and eight cups of coffee a day, but since beginning to chew as he had been taught, he had lost the taste for coffee, and now sometimes did not drink one cup in two or three days. Most of the children took the trouble to explain how much better they liked the new way of eating. Many interesting and varied accounts were related which showed how thoroughly they had taken up and were pursuing the prescribed course of action.

Operative Dental Work.—In the meantime Drs. Loupe and Moffett were treating the teeth of each child. Regular appointments were made and the teeth of each child put in good condition. Dr. Chas. K. Teter performed what extractions were needed, and Dr. Varney Barnes did some work in orthodontia.

CHARACTER OF THE MEMBERS OF THE "DENTAL SQUAD."

So much for the work done; now for results. As has been mentioned before, selecting only according to the record on the charts gave us children of various types. We had some who were well behaved, earnest, and bright children,

and we had some of the most disobedient, reckless, and troublesome ones. The class, as it first presented itself, notwithstanding all that had previously been done for them, was not prepossessing. One of the brightest and nicest girls in the class suffered very frequently from sick headache. Most of them had sallow, muddy complexions, and three of them were on the point of being taken into juvenile court for truancy. One little boy was a candidate for the "boys' school" because of incorrigibility. He was a nuisance to the school-room and a terror in the school-yard. The others were between the two extremes.

MENTAL EFFECTS OF THE "DENTAL SQUAD" EXPERIMENT.

Each case was closely watched and each, as the work went on, showed marked improvement. The little girl subject to sick headaches not only was entirely cured, but her mother, who followed the directions laid down for the little daughter, found relief from the same trouble. The complexions cleared, a spirit of self-respect was manifest; truancy, indifference, and incorrigibility in these children disappeared.

In their mental tests they have made a very considerable gain, 99.8 per cent., which comes very close to doubling their ability.

The children who needed the improvement

most were the ones who made the greatest gains. This gain of 99.8 per cent. was shown, as we have said, in the psychological tests. The tests were given one in May and one in June of 1910, the next one in August, then one in September. The last two were given on the 4th and 17th of May, 1911. The longest time spent on one phase of the work during a test was less than three minutes, therefore the pedagogical principle of repetition could not be effective because of the lapse of time between each apperception. The mental picture was wholly effaced before the next test was given.

The increase in ability to do the work of the psychological tests is due to increase of power in the child rather than to accumulated knowledge—a distinction that is of great importance to the educator. Such results obtained in the class-room distinguish the true educator from the drill-master.

The children's gain in health, self-respect, and knowledge of higher and better living cannot be marked in "per cent." But who will say that it is not equally if not more valuable? And the lesson in perseverance and continuity of purpose which they have had, while not adding anything to the dental experiment, can be placed in the column of assets.

Speaking of their perseverance, we would all say that the anticipated reward of five dollars

in gold was an incentive to them. But the fact is that the five dollars was given at the end of seven months' work, and during the remaining seven months, or up to the present time, each and every child has been equally persevering, if not more so, and that with no reward in sight except what was known to be the real benefit that comes to them by faithful attention to oral hygiene.

Just before the close of school last May I asked the children to write me a letter telling me what they thought of this experience. The whole theme of their letters seemed to be gratitude for what was done for them. We should need no stronger proof of the efficacy of the work than the affidavits of the children themselves.

One of our school officials, after witnessing one of the tests and hearing some of the testimonials, very aptly remarked that in this day and age we might revise the expression, "Out of the overflowing heart the mouth speaketh," and say instead, "Out of the sanitary mouth the overflowing heart speaketh."

DATA CONCERNING INDIVIDUAL MEMBERS OF THE SQUAD.

We will now give some specific data concerning the different children: Sol Katzel, Frank Silverstein, Jacob Bernstein, Joe Todd, Lillian

Gottfried, and Helen Wright did last year in twenty-four weeks the same work regularly done in thirty-eight weeks, and were graduated for high school in February instead of in June.

Frank Silverstein was quarantined on account of scarlet fever in his home. He helped nurse the younger children, and every one of the six children in the family contracted the disease except himself. The attending physician attributed his immunity to his healthy physical condition.

Helen Wright was weak and nervous, and subject to frequent headaches. Not only has she grown robust, but her headaches have disappeared.

Sam Katzel in May, 1910, was in the sixth grade. In May, 1911, one year later, he was graduated from the eighth grade, having accomplished two entire grades in one year. He had failed through indifference the year before.

Ben Dimenstein at our district athletic meet this year won first place in the lightweight dash and first place in standing broad jump, securing almost two-thirds of all the points won by the school. Last year, although competing, he did not bring us one point: he says that his success was due to oral hygiene.

Becky Goldstein has had, I believe, the hardest struggle in the class. Her teeth were very irregular, the worst case of malocclusion I have

seen. During the winter her mother met with an accident and was taken to the hospital for an operation, leaving in Becky's care a baby two weeks old. This baby was the sixteenth in the family, and Becky the eldest daughter. For two months Becky, with the help of a younger sister and with the advice and help of some women of the neighborhood, cared for the baby, regulated the household, and came to school occasionally one or one-half day when she found some neighbor who would take the baby for a time. By so doing she kept in touch with the work at school, and was promoted with her class in June. But the most remarkable fact is that during that time, though she had not one unbroken night's rest on account of her anxiety for the baby, she retained her vigor and strength through it all.

Rose Lieberman, Lillie Semlakowsky, and Lillie Cohen have the prettiest sets of teeth, and made a most marked improvement in complexion. Their improvement may be said to be æsthetic.

Annie Pankuch had severe kidney trouble, and was a fragile, delicate, nervous child. In every respect she was greatly improved, and is sturdy and well to-day.

Rachel Somers led her class in the last promotions.

Gussie Hammerschlag, Beatrice Kramer,

Bertha Semlakowsky, Sarah Macklin, Frieda Goldman, Selma Perlick, and Helen Cohen have shown improvement in scholarship, behavior, health, and appearance.

Issie Grey's father says that since Issie has entered the dental class he has improved so that he would not give him now for all his other children put together, and we have some very nice children from the Grey family.

Hannah Cohen has not had the full quota of mental endowments. She has been in America about three years, has had many difficulties to overcome, and made a gain of 444.82 per cent., besides improving greatly physically.

Ida Goldman has been the most timid child in the class. Her fear of the dentist was such that at first I remained with her, and held her hands while the dentist worked. She responded less readily, though she made a gain of 101.83 per cent.

Harry Freeman and Abe Meyer have been good, faithful, steady workers and have made gains, besides brightening up and showing physical growth.

The last and banner pupil is Morris Krause. Morris had ideas peculiarly his own as to what a boy's duties and privileges were. Those ideas were so much at variance with the conventional standards that difficulties arose, seemingly insurmountable at times. Since working with the

class he has been manly, tractable, and does not even seem to have the temptations that repeatedly assailed him and were almost the means of his down-fall. The result obtained for Morris alone was worth all our efforts.

THE LESSON TAUGHT BY ORAL HYGIENE.

I am thoroughly convinced of the efficiency of oral hygiene. I believe that if each child be taught to intelligently keep thoroughly clean and healthy the gateway to his system, the mouth, we will have a healthier, more self-respecting, and all-around better class of citizens for the next generation. What has been done for these twenty-seven children may be done for every child. If we are called upon to educate children living in crowded city quarters, breathing varieties of harmful gases instead of pure air, eating food adulterated or sold from shops that display their goods uncovered and exposed to the germs that are scattered by that portion of our six hundred thousand population that may chance to pass that way; if, as a distinguished physician says, the majority of cases of pulmonary tuberculosis are contracted through the alimentary canal—then we must fortify our children by every means in our power;—and one of the most effective guns on our fortification is a practical working knowledge and training in ORAL HYGIENE."

The writer feels that this report is a remarkable showing, and that it should challenge the attention and interest of every one in any way connected with the subjects of primary or secondary education, public health, or good citizenship.

In what way can the thought and energies of our school boards, public health boards, managers of philanthropic institutions, the State and the public generally be better spent than in removing these dangers to the health, physically, mentally, and morally, of our schoolchildren?

The results of the experiments above quoted prove beyond the shadow of a doubt that if oral hygiene were taught in our public schools, and the teeth of the children properly cared for, at public expense when necessary, but insisted upon when parents were able to bear the cost, great advantage would accrue to the State.

This advantage would be of the greatest moment economically, as it would materially lessen the expense of education, reduce the number of the sick and the mentally incompetent that become a pub-

lic charge, also lessen the number of criminals and insane persons that have to be taken care of by the State, and greatly assist in elevating the physical, mental, and moral stamina of the nation. *"The health of the people is the supreme law."*

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